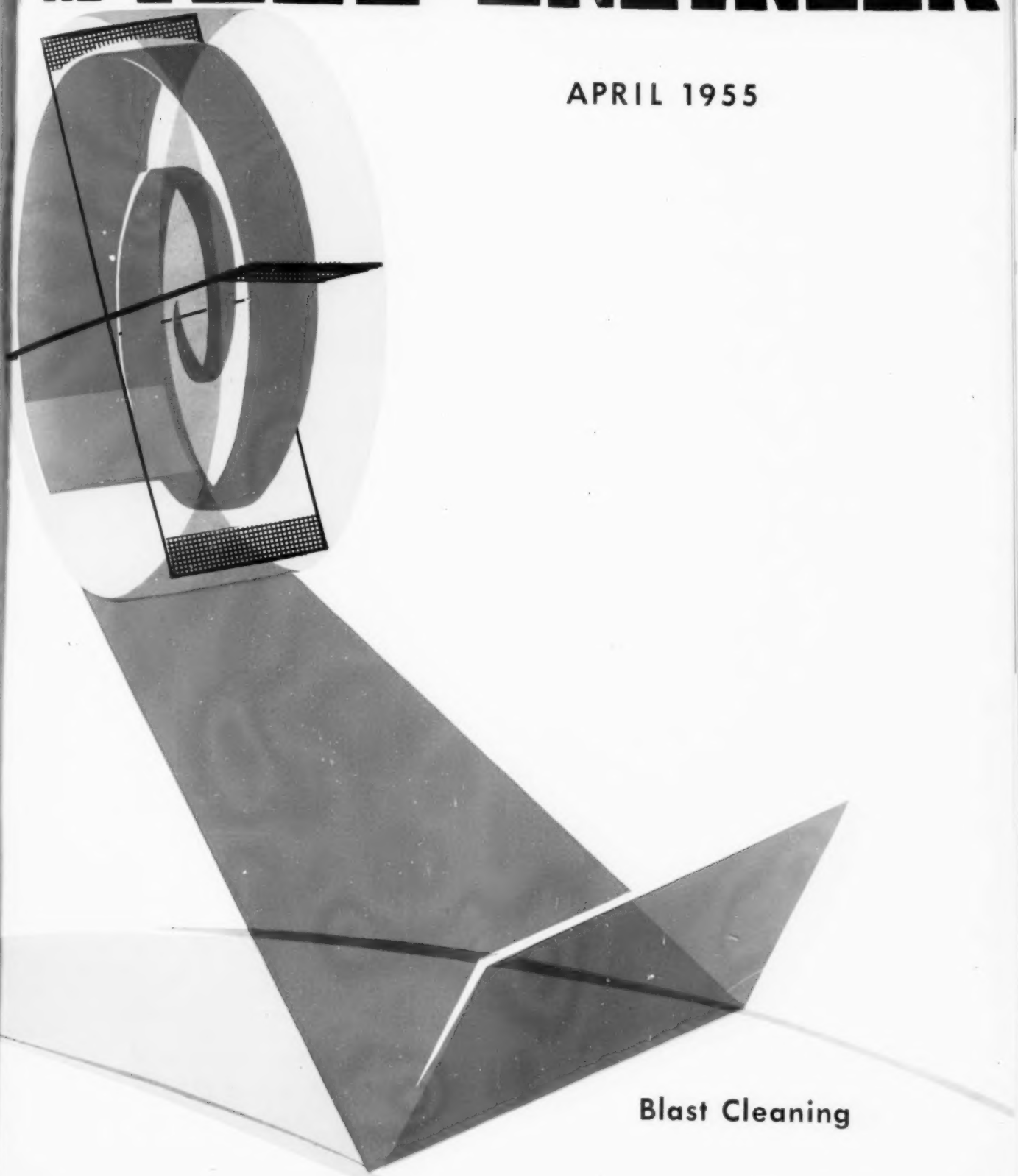
THE TOOL ENGINEER

APRIL 1955



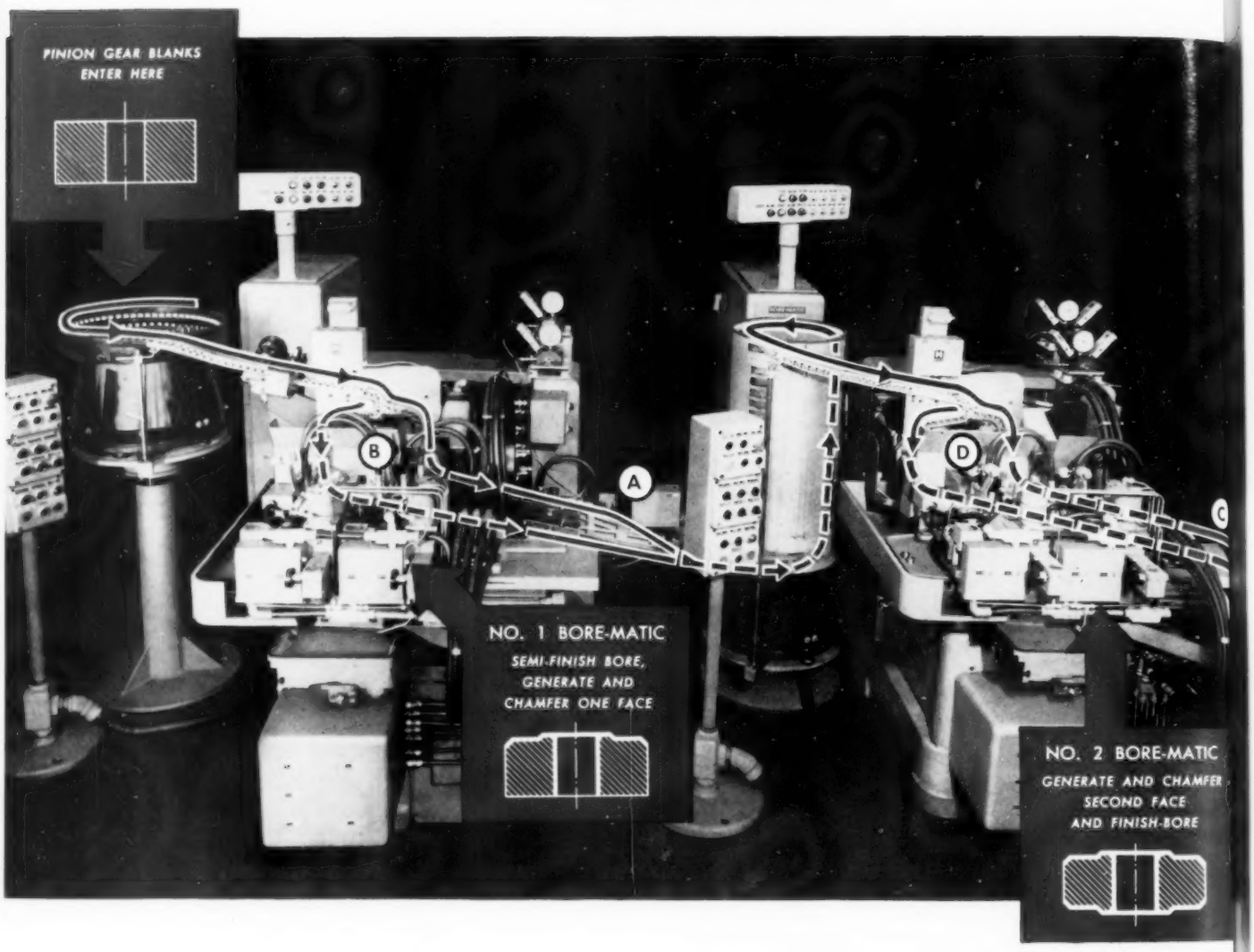
Blast Cleaning

PUBLICATION OF THE AMERICAN SOCIETY OF TOOL ENGINEERS

gear-blank Borizing

COMPLETELY AUTOMATED

by HEALD



THIS HEALD automated Bore-Matic installation performs every operation completely automatically — including work holding, inspection, loading, borizing, ejection, gaging, sorting and tool setting. Here's how it works.

Parts are fed from a vibrating hopper into the loading chute of Bore-Matic No. 1, where they are inspected by a "go-no-go" gage, loaded into chucks and borized two at a time to semi finish the bore and generate and chamfer the outer face. They are then fed to the gaging station at "A" where parts are simultaneously air-gaged for bore size. Gaging data from this point is fed back to the boringheads "B", automatically advancing the tool if bore is undersize or retracting it if bore is oversize. The correctly sized parts then go to the second vibrating loader for No. 2 machine, where they are faced and chamfered on the second side and finish-bored, two at a time. At sorting and gaging station "C" they are again air gaged and boring tools at "D" automatically adjusted to correct for bore size if necessary.

This installation shows how Heald engineering and equipment fit into the modern automated production line. But no matter how much or how little automation you need .... **It pays to come to Heald!**

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Cover: Shot blasting is a production process that is being increasingly applied to clean metal parts and prepare surfaces for coating. In his article beginning on Page 96, Victor F. Stine describes abrasive types available and indicates when to use each.

The Tool Engineer

Volume XXXIV, No. 4 April 1955

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THE TOOL ENGINEER is regularly indexed in the *Engineering Index Service* and the *Industrial Arts Index*

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THE TOOL ENGINEER

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10700 Puritan Ave.
Detroit 38, Mich.

Publication Office:
239 E. Chicago St.
Milwaukee, Wis.

THE TOOL ENGINEER is published monthly in the interest of the members of the American Society of Tool Engineers. Entered as second class matter, November 4, 1947, at the post office at Milwaukee, Wisconsin, under the Act of March 3, 1879. Yearly subscription for members, $2.00. Non-members, $6.00. Canada, $6.50; all other countries, $8.00 per year.
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The Tool Engineer

Human Understanding

To convince management of the economic advantages of automatic processes and improved production methods is not sufficient. The tool engineer must also show the workman how he benefits individually. That may not always be an easy task. Already "automation" has become a nasty word in labor negotiations. This is unfortunate and unrealistic but true.

The tool engineer's cardinal objective is to make better products at lower cost for more people. In achieving this altruistic objective, he must minimize the possibility of adverse effects upon the workman and his morale. Further, there is always the possibility of a situation being misunderstood, either intentionally or not, to serve the purposes of those who would sacrifice the economic good for a selfish gain. There will always be someone willing to exploit anyone for personal profit.

Somehow, human nature resists change, particularly when the change is not fully understood. This is especially true of a worker. Unquestionably, automation removes a type of skill from production. Even though that skill may be monotonous drudgery, its elimination would be resented unless the worker is shown how to use his abilities in a more productive way, increasing his importance and value to his company as well as enlarging his earning capacity.

Many executives do not understand why the shop could resent automatic machines that perform repetitive operations better and quicker than can possibly be done manually. Are memories so short? Have conditions during the early 30's been forgotten? Tooling developments then were insignificant compared to today's and the near future's standards. With proper teamwork and understanding, production improvements will not be sabotaged but will be accepted in their proper light.

No one questions the production methods used in petroleum processing. Yet that industry represents a high degree of automation. Who could afford the luxury of driving an automobile if gasoline were made in batches by stew-kettle methods?

Through his achievements, the tool engineer has earned public confidence. He must guard that trust. This will require not only professional ability but also human understanding.

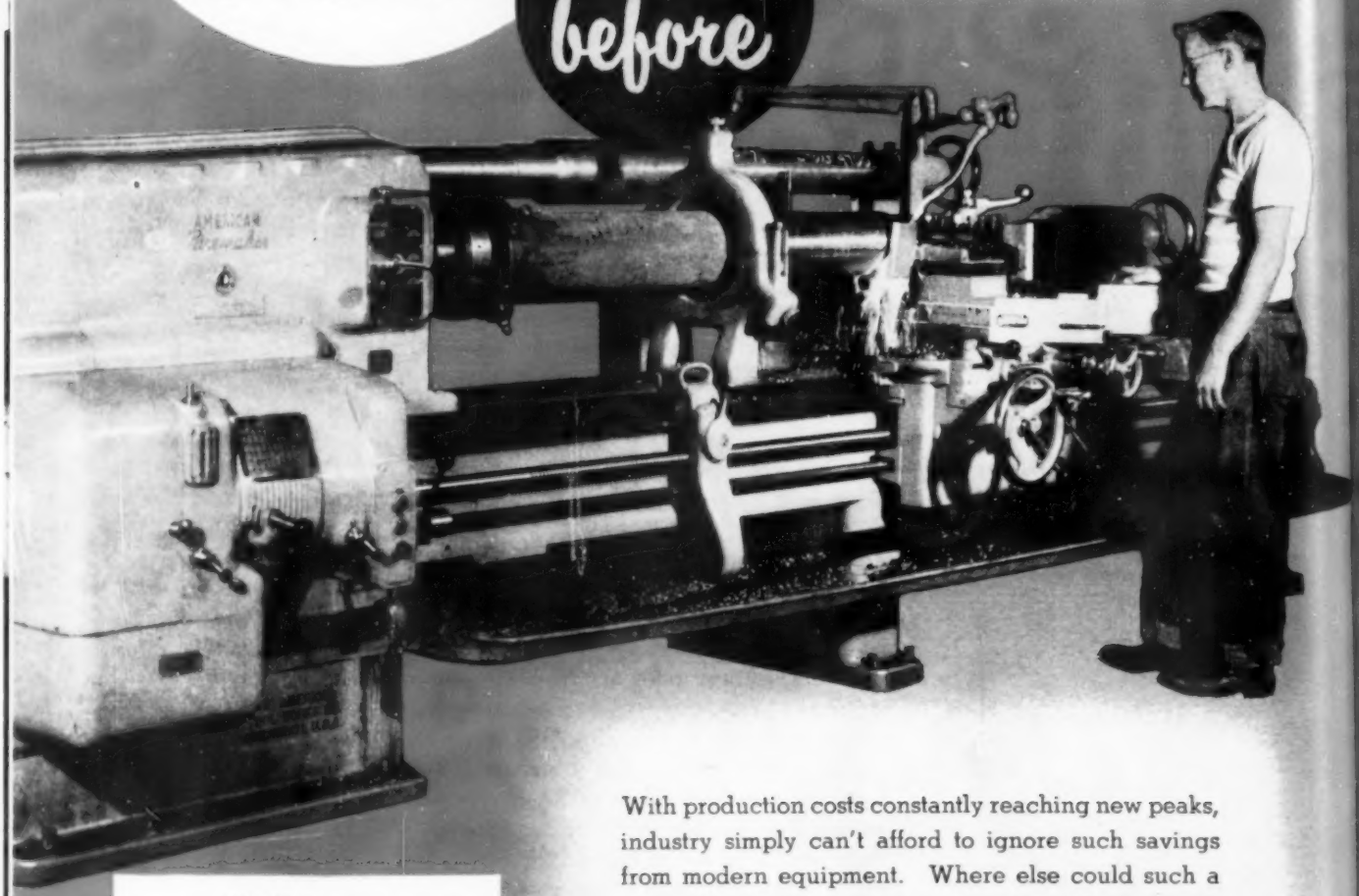
John W Greve

EDITOR

2¼ hrs. now

9 hrs. before

Fairbanks, Morse & Co., Beloit, Wisconsin, is *really* putting the payroll dollar to work with its new 20 inch "AMERICAN" Heavy Duty All-Hydraulic Duplicating Lathe.



2000 horse power Fairbanks-Morse motor shafts are now being rough and finished turned in 2¼ hours floor to floor against a former time of 9 hours per shaft.

With production costs constantly reaching new peaks, industry simply can't afford to ignore such savings from modern equipment. Where else could such a magnificent return upon an investment be secured, and how else can costs be lowered to meet an increasingly competitive market?

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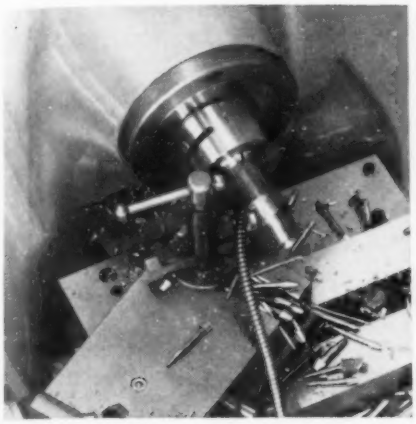
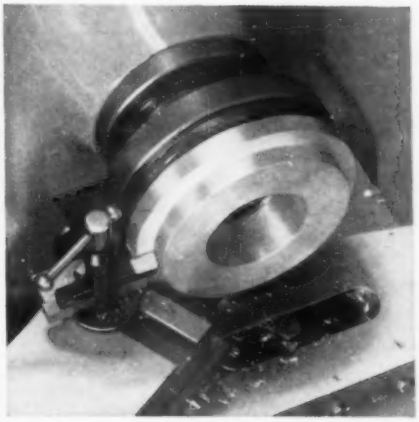
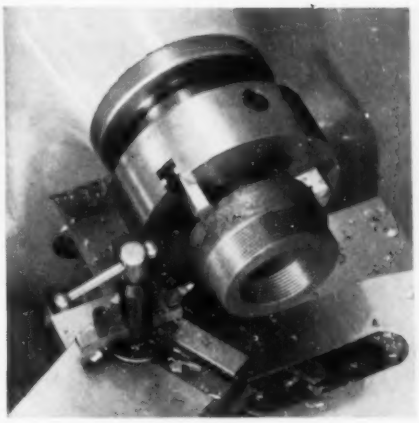


Precision Collet work for all sizes to 1-1/16" Collet seats *directly* in spindle.



Precision Step Chucks for diameters up to 6". Provides Collet-like accuracy.



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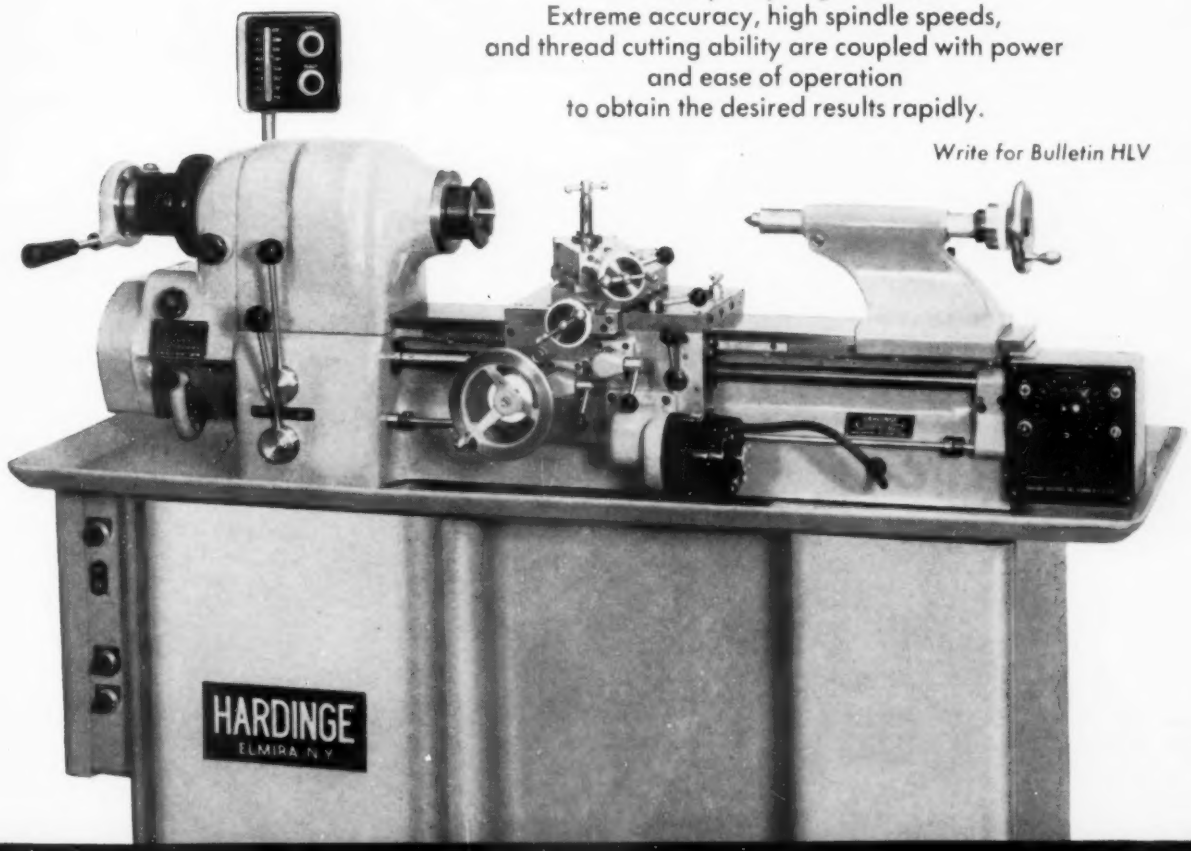
Write for Bulletin HLV



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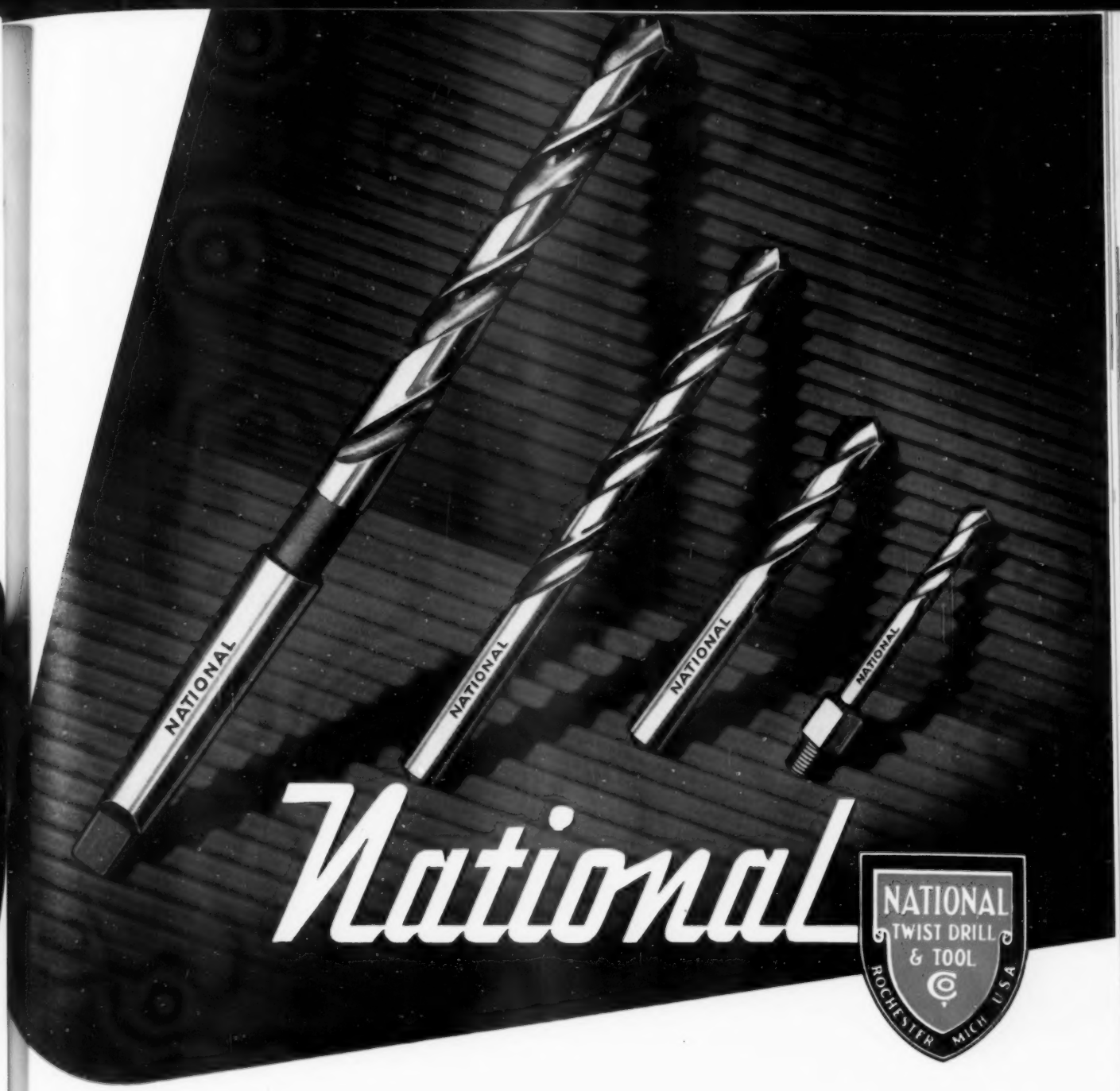

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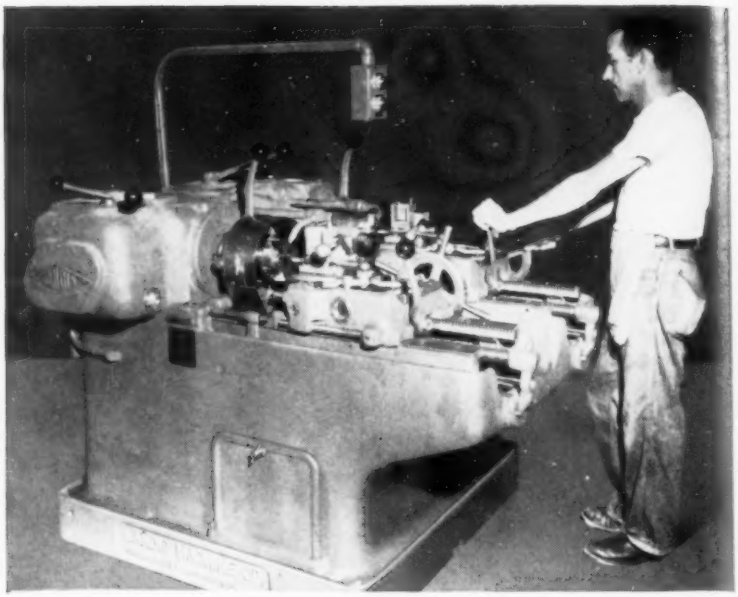

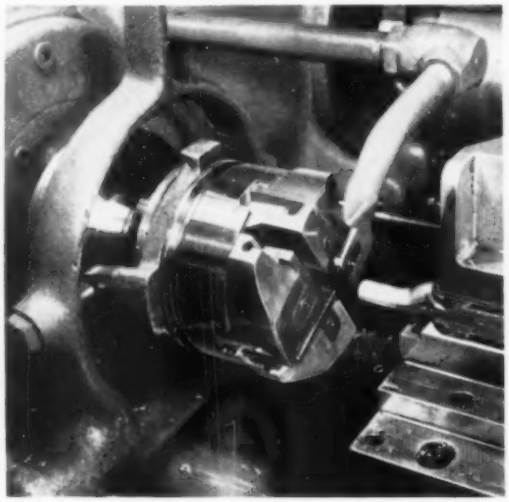

BY turning, facing, and chamfering on Landis Threading Machines, automotive parts production at Thompson Products in Detroit has been substantially increased. This LANDIS **Hollow Milling** technique makes large out-put increases possible by applying a number of simultaneously-functioning cutters, thus multiplying the feed rate of a single tool.

The illustrations show one of these parts, steering links, being turned and faced on a LANDMACO Double-Spindle Leadscrew Threading Machine. SAE 1040 steel forgings are turned (1/32" stock removal) 1⅛" in length and faced by four special turning cutters in ⅞" V LANCO Hardened and Ground Heads. Production regularly averages 200 pieces per hour, with the ⅝" turned diameter held within ±.004". Four hours production is obtained between cutter grinds.

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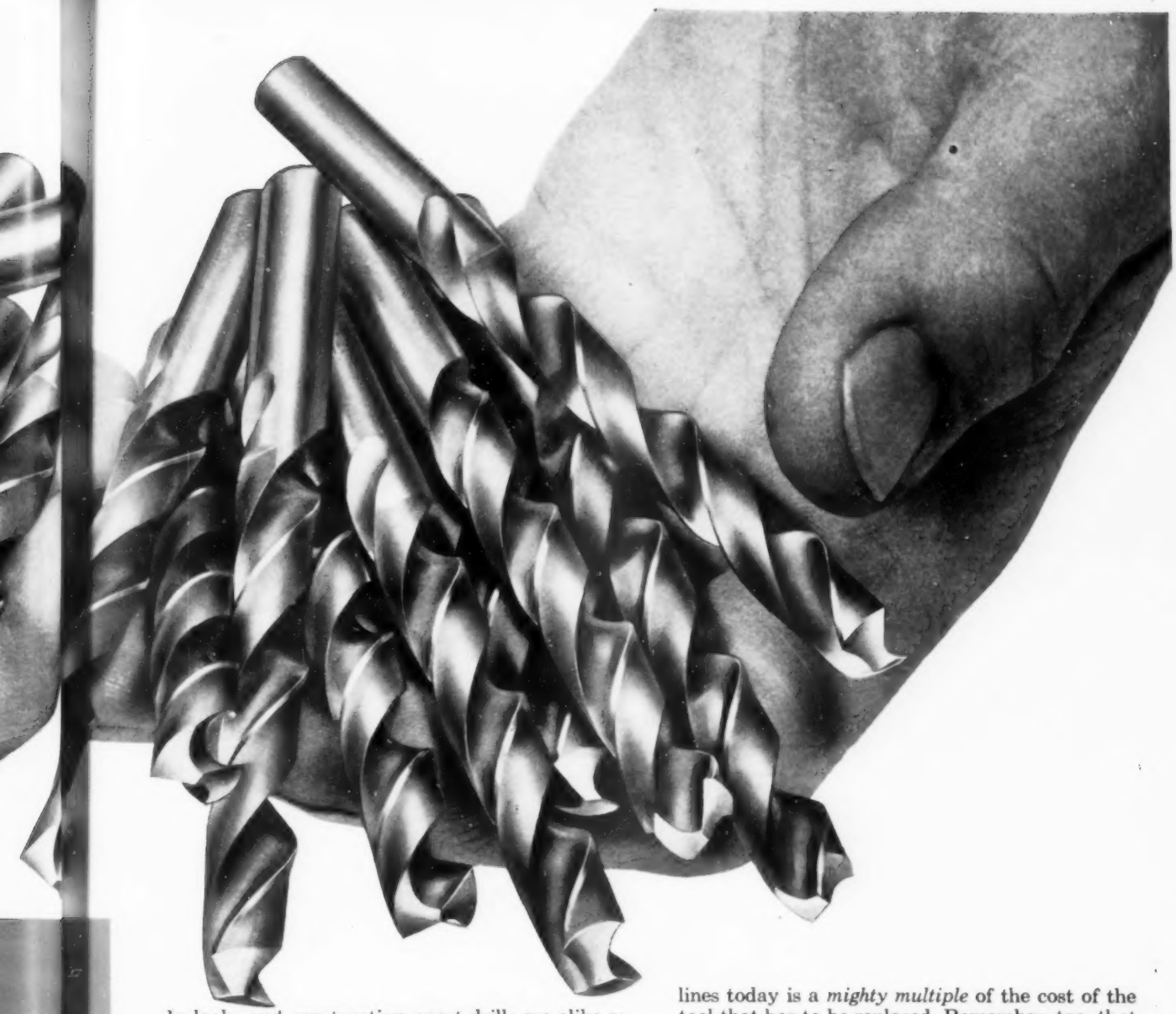

In looks and construction, most drills are alike as peas in a pod. *But the all-important difference is in the accuracy and quantity of the holes they cut.* So when you come right down to it, the price of the drill itself means little. It's the *cost-per-hole-produced* that really counts.

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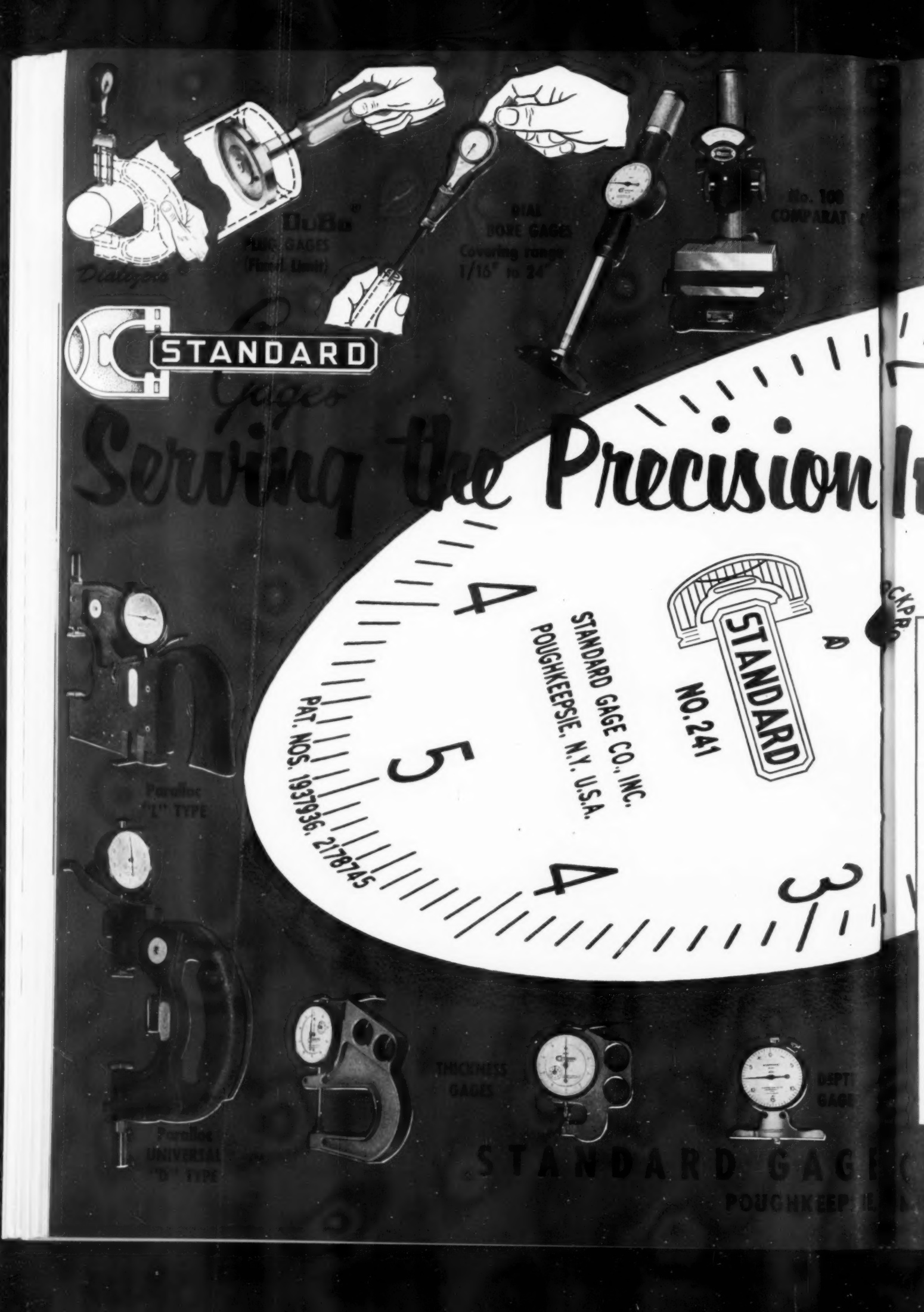
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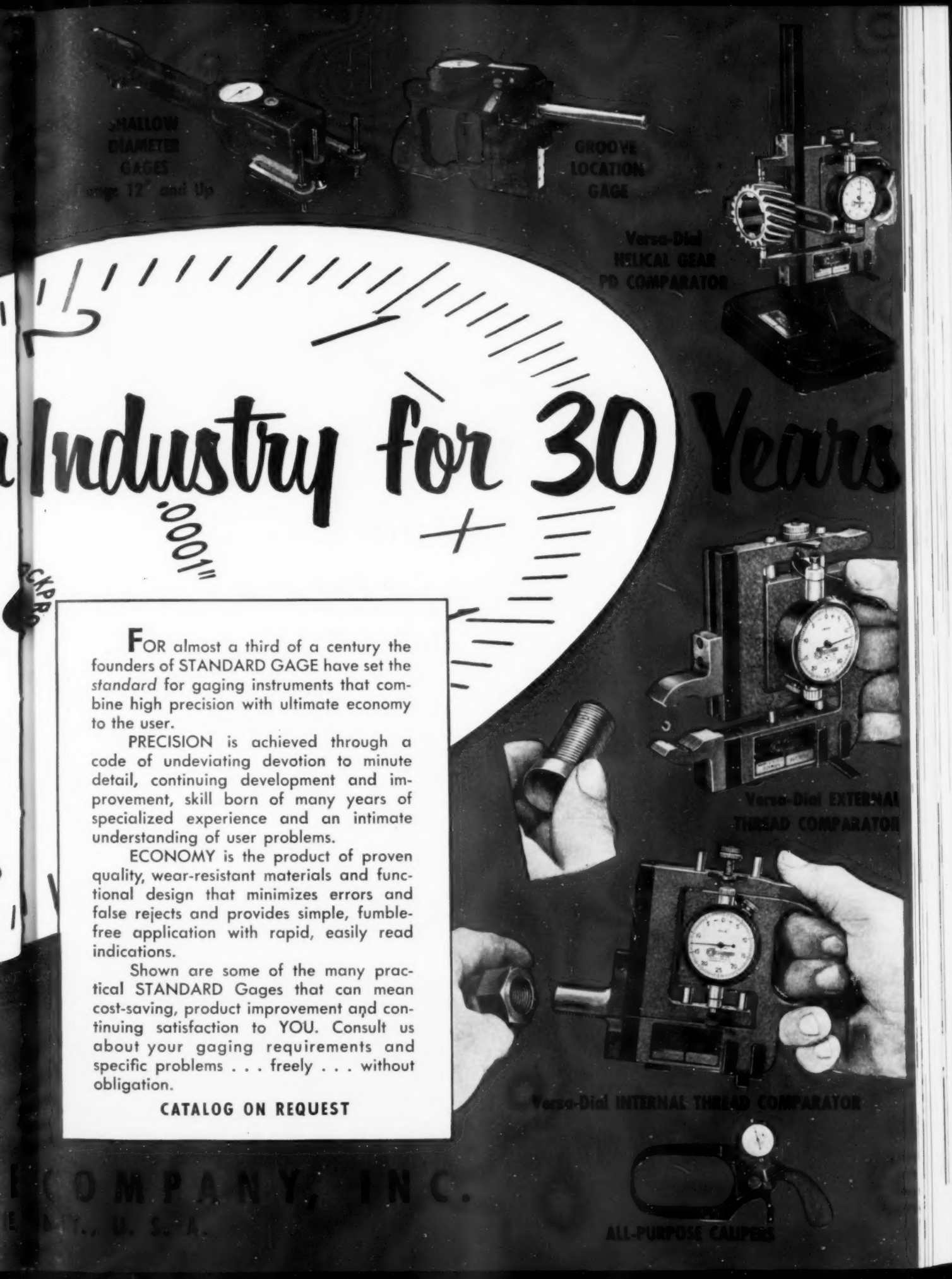

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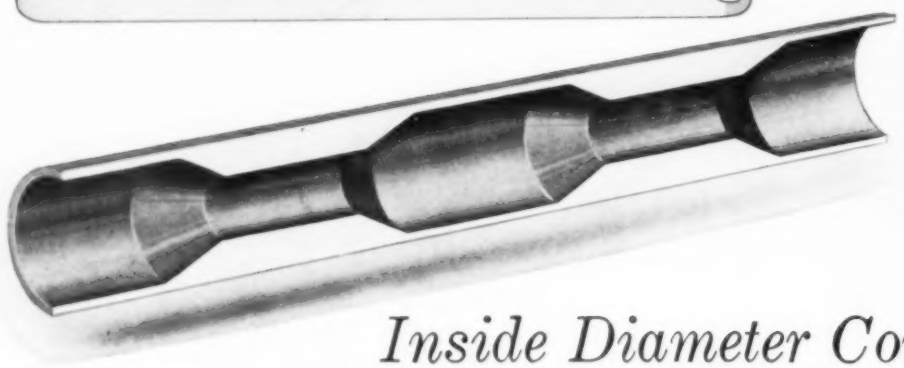
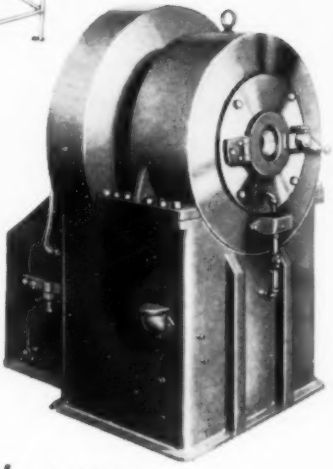
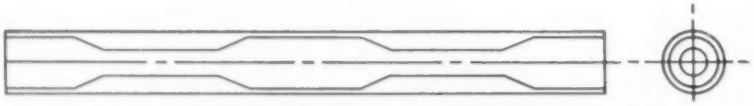
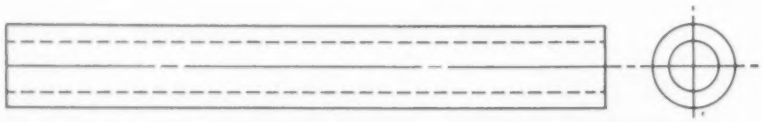




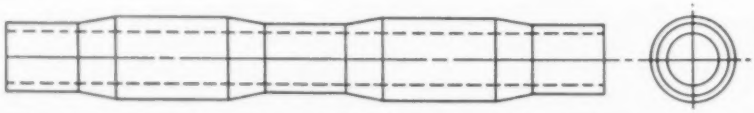
Inside Diameter Contours Easily Produced by Swaging



Machining multiple-diameter contours on the inside of cylindrical pieces (Fig. 1) is a difficult, time-consuming job.



Torrington's Swager experts start with tube of larger OD (Fig. 2) and machine the blanks to predetermined outside shape (Fig. 3).



Simply by swaging the outside to a straight, uniform diameter, the intricate contours are transferred to the inside (Fig. 4). Result: a sizeable saving in machining costs.

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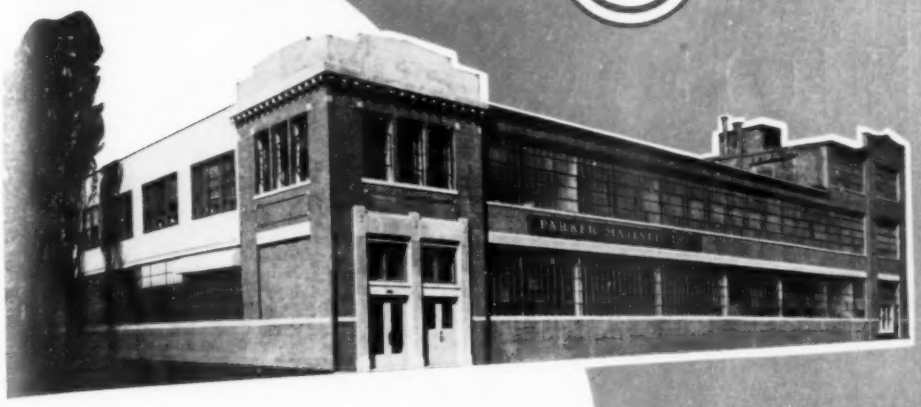

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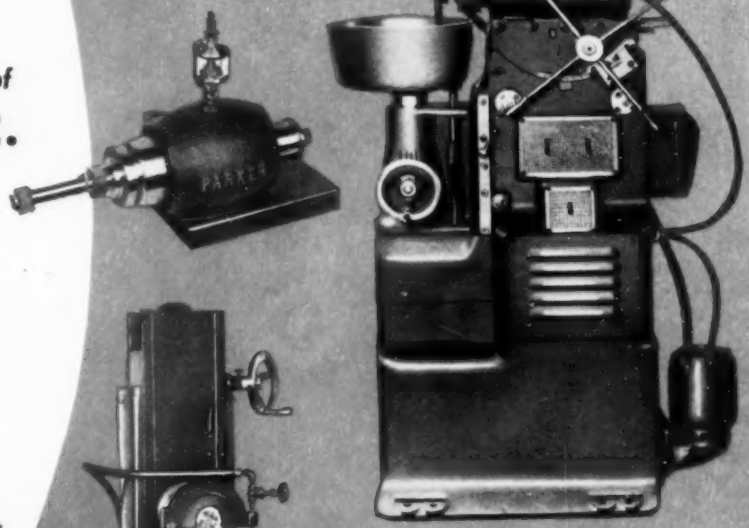

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Hollow Mill Maker finds

DBL-2
High Speed Steel

HARD, TOUGH and VERSATILE

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Production Pointers from GISHOLT

TIME-SAVING IDEAS

Presented as a service to production men, we hope some of these interesting ideas, chosen from thousands of jobs, will suggest ways to help cut time and costs in your own work.

GISHOLT JETRACER SIMPLIFIES CONTOUR BORING OPERATIONS

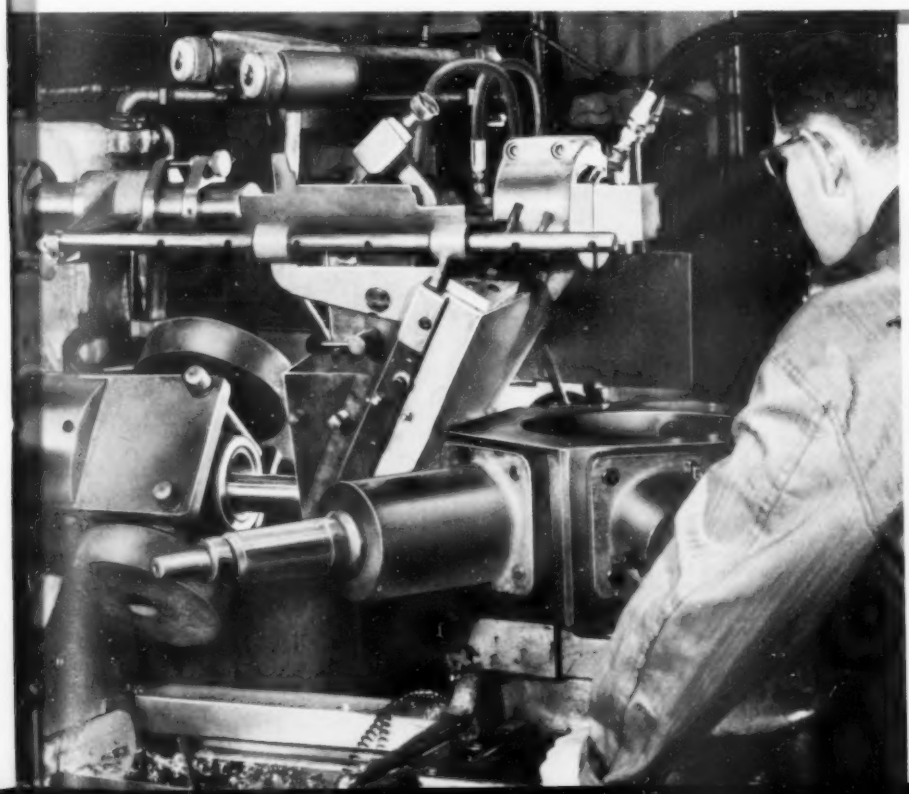
Low-cost Unit Added to Late Model Saddle Type Turret Lathe

How to get still more production and lower costs out of present equipment? Mission Manufacturing Company, Houston, Texas, can show you a good example in the machining of steel valve bodies.

The time and money saver is a hydraulic tracer unit, added to a Gisholt 3L Saddle Type Turret Lathe. Operation of the turret-mounted *JETRACER* is simple. The entire unit, including template, is self-contained and mounted on a single face of the hexagon turret. This in no way restricts use of the overhead pilot bar.

With the Gisholt *JETRACER*, production has been increased 25%. A low-cost, standard, single-point tool replaces expensive special sizing tools. Considerable time is saved on gauging, since only one diameter needs to be checked. Uniform quality is an added advantage automatically achieved, because the chance for human errors is done away with in boring operations.

New ideas pay off handsomely: Increased output plus repetitive accuracy in difficult boring operations result from this turret-mounted Gisholt JETRACER.



◀ Note template and stylus which follows contour for boring operation.

Typical workpieces, rough and finished, handled in this setup. ▼

GISHOLT

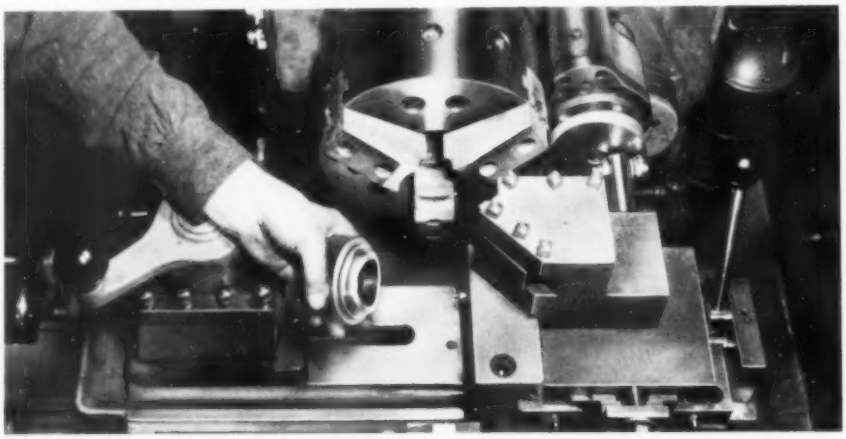
TIME-SAVING IDEAS

WAVE FACES EASILY GENERATED WITH THIS SLIDING TOOL BLOCK SETUP

Simple Solution to Unusual Job on a Ram Type Turret Lathe

Talk about tricky shapes to generate, look at this lug insert forging. Yet it's easily done with this setup on a Gisholt No. 5 Ram Type Turret Lathe.

This close-up shows sliding tool block arrangement on the No. 5 Ram Type Turret Lathe.



For chucking there is a spring-loaded locator in the spindle for correct radial location on the rib on the back of the part. Tools on the hexagon turret drill, bore, co-bore, rough turn, undercut and chamfer.

The problem surfaces are generated by tools in a special sliding tool block on the rear of the cross-slide. The block is actuated by a cam which rotates in time with the spindle. A spring-loaded roller attached to the sliding tool block follows the contour of the face of the cam, causing tools to perform contour machining on the workpiece.

Expert tooling with sliding tool block arrangement and the use of the right machine give a low 4.3-minute f. t. f. time including this unusual facing job.

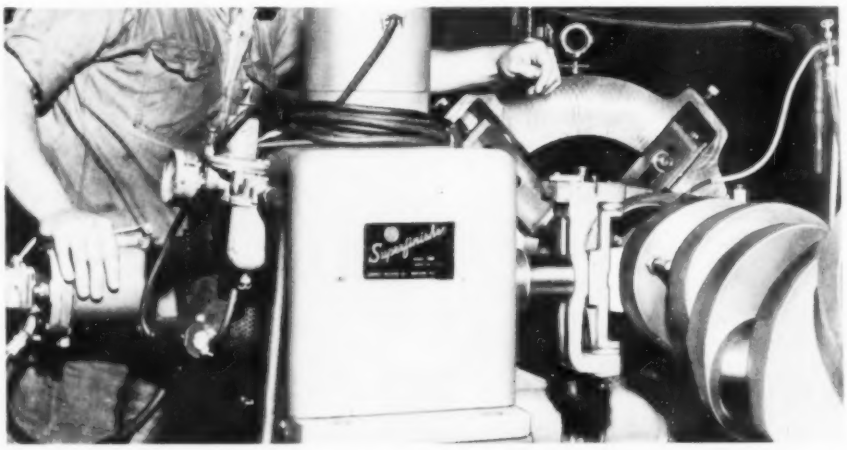
LARGE CRANKSHAFTS SUPERFINISHED WITH LOW-COST LATHE ATTACHMENT

Better Wearing Surfaces Achieved Without Adding Extra Operation

To get the longer bearing life demanded of crankshafts in today's higher speed diesel engines, this manufacturer uses Superfinish... and at a minimum of equipment cost.

The main and crankpin bearings are turned on a lathe to .001-inch tolerance. Then, without removing the crankshaft from the lathe, a Gisholt No. 4 Superfinishing Attachment, which has been substituted for the front tool post, is used to Superfinish these vital surfaces down to 10 micro-inches RMS. The required micro-inch surface finish is produced without an intermediate grinding operation.

You can see the savings in time and equipment by this setup. The quick Superfinishing operation exposes true base metal so that the crankshaft operates on harder, smoother bearing surfaces for a longer trouble-free service life.



With Superfinisher attachment mounted on the lathe, machining and Superfinishing jobs are done in one chucking.

Finer bearing surfaces and improved geometry by Superfinishing make these crankshafts better performing—at less cost than former finishing methods.

Helpful Catalog, recently printed, gives explanation of Superfinish and shows many applications. Write for your copy.

Your New Machine Tools—
Cash?... On Time?... Lease?

What's the most practical way for you to obtain new machine tools? You have a choice of several plans... all clearly explained and illustrated with examples in this new bulletin. Ask for your copy of Form P-1173, "What You Should Know About Buying and Renting Machine Tools."

GISHOLT

TIME-SAVING IDEAS

...OW BRAKE DRUM OUTPUT WAS INCREASED 50%

...cision Taper Boring Extra Benefit of Fastermatic ...tomatic Turret Lathe

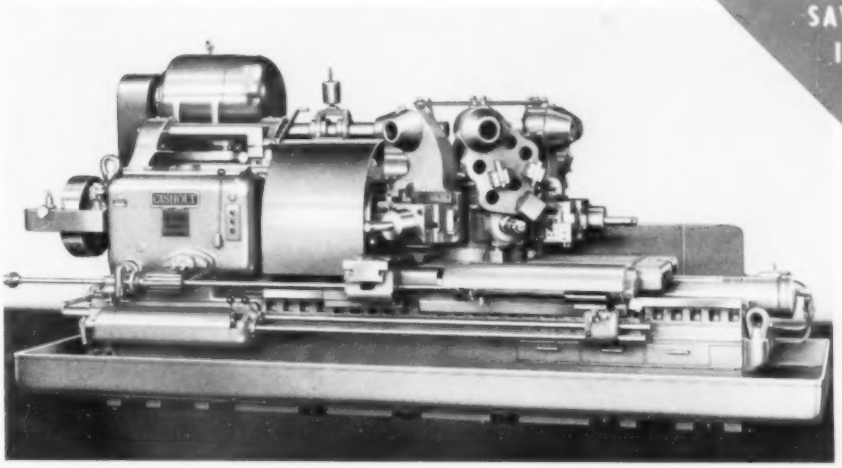
...eater output and greater precision were the objectives when refiguring this job...machining road grader brake drums.

The job is now handled on a Gisholt 4F Fastermatic Automatic Turret Lathe. This is equipped with special jaws to compensate for uneven chucking surfaces and hold the drum rigidly for the multiple cuts.

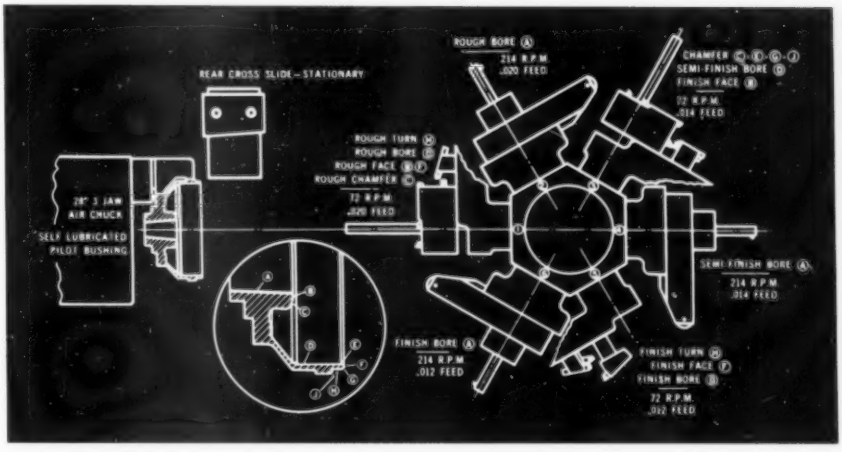
Taper boring (A) is done with a boring bar and cutter mounted in a turret facing slide tool. Three of these slide tools are used with a special cam block mounted on the stationary rear cross-slide which guides the spring-loaded slide tools along the taper angle of the bore. Result is precision gauge fit every time. These slide tools are alternated on the turret with other standard tools which bore, face, chamfer, and turn other sections of the drum.

The large parts are completed in 23.1 minutes—a 50% reduction in f.t.f. time of the former method.

The Fastermatic has the right combination of rigidity, accuracy and automatic features to provide important time- and labor-savings on this job.



Gisholt 4F Fastermatic Automatic Turret Lathe



EASIER CALIBRATION SPEEDS BALANCING OPERATION

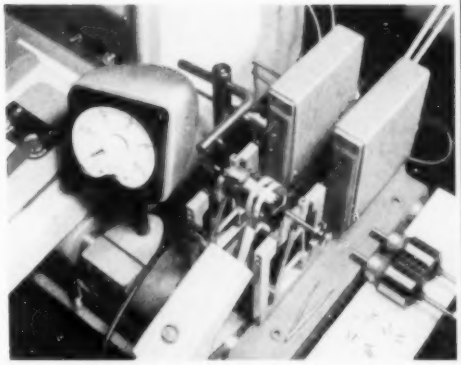
Amount of Required Correction Directly Indicated on Gisholt DYNETRIC Balancers

Production balancing of universal motor armatures is generally at a rate of 125 parts per hour, including measurement, correction and inspection. Fast, accurate, easy-to-operate equipment is a necessity.

This manufacturer uses a Gisholt OSB Bench Balancer to dynamically balance every armature. Six different sizes of extruded aluminum strip are used to correct for balance. The direct reading amount meter, calibrated so that one unit represents the smallest strip, quickly indicates which of the six sizes must be used to produce balance.

It takes only 15 seconds in this case to determine accurately which strips are to be used and the positions in which they are to be placed at each end of the armature. Can you imagine anything easier?

Gisholt Balancing Machines offer many fine features which add up to quick, accurate, low-cost balancing operations. Ask for your copy of new general balancing catalog, No. 1109-A.

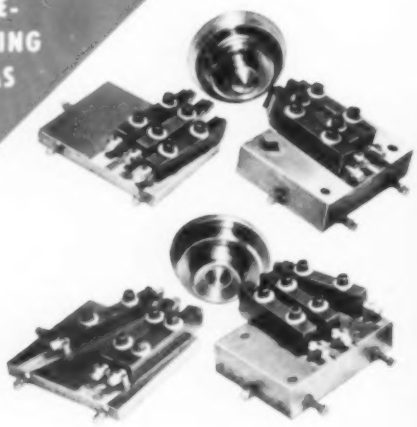


DYNETRIC BALANCERS GISHOLT

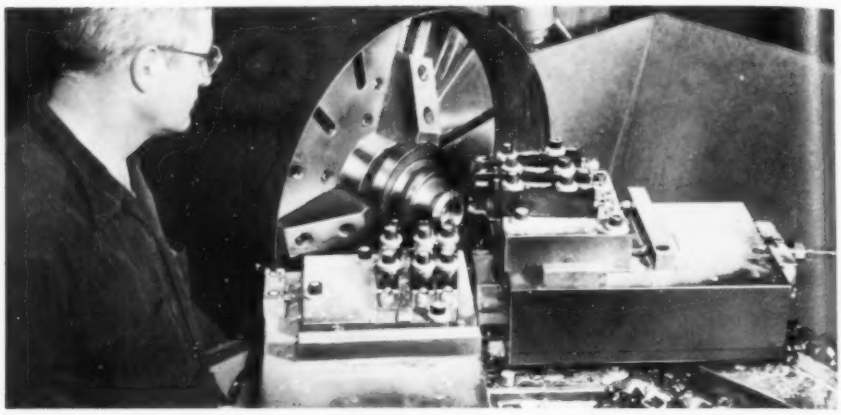
TIME-SAVING IDEAS

TIP FOR FAST CHANGEOVERS... PRE-SET TOOLING LIKE THIS

How a little extra planning saves a lot of money —with the Gisholt Simplimatic Automatic Lathe



(Right) Tooling for one type cutter bit. Photos above show pre-set tooling for two other types.



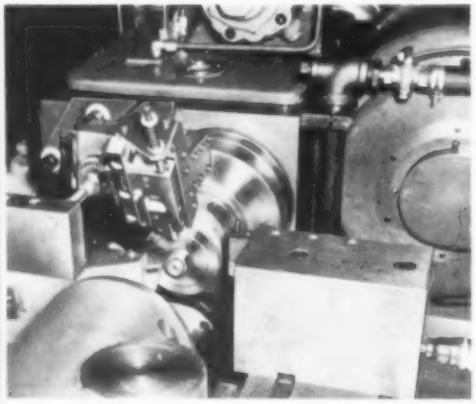
Here three different types of steel oil well cutter bits, each in two sizes, must be handled. Good reason for carefully planning changeover.

The solution is nicely provided by a Gisholt Simplimatic Lathe and pre-set tooling. Each type of cutter bit has its own tooling which is set before being mounted on the tool slides. Special tool bits are bolted in milled slots on steel spacer plates. These are then mounted on the slides. The Simplimatic's front and rear slides have swivel bases to facilitate correct angular adjustment. Time for workpieces shown in photos is only 2.40 minutes.

Changeover with pre-set tooling on the Simplimatic saves time in handling these six different workpieces.

SPECIAL TOOLING COMBINES TWO OPERATIONS IN ONE CHUCKING

No. 12 Hydraulic Lathe Uses Auxiliary Slide to Form Grinding Relief



Headstock-mounted slide feeds tool at 45 degree angle to form grinding relief. (tailstock retracted to show tooling)

How to finish these steel turbine converter hub forgings in one chucking with a minimum of special tooling?

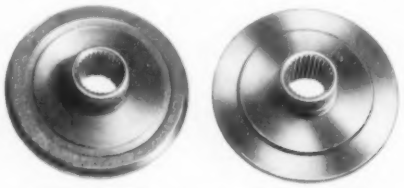
First, the work is chucked in the splined I.D. on a special splined mandrel, the end of which rotates slightly off-center to grip and drive the part. A tailstock provides additional support.

Tooling on the front carriage and rear independent slide finish turns the two hub diameters, finish faces the flange and sizes the pilot diameter. Since the front carriage and rear slide are used for standard machining operations, they are not available for forming the grinding relief between the hub diameter and its adjacent face. Instead, a headstock-mounted auxiliary slide is used. Movement of the front carriage actuates this slide which feeds in at a 45 degree angle to form the grinding relief.

Floor to floor time is only .4 minute with the auxiliary slide permitting the part to be finished in one chucking.

An extra operation is saved by this relatively simple auxiliary slide arrangement on the No. 12 Hydraulic Automatic Lathe.

Rough and finished workpieces showing surfaces machined in this operation



No. 3-455

635

THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT MACHINE COMPANY Madison 10, Wisconsin

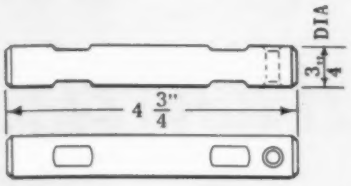
TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

HERE'S ONLY ONE WAY
O DO A JOB BEST...

Another Production Solution

by MOTCH & MERRYWEATHER!

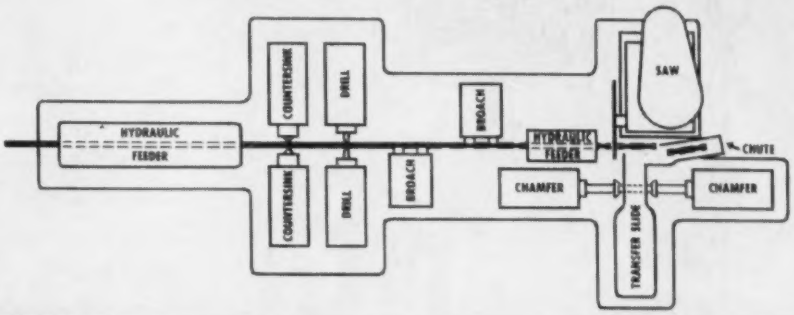
THE JOB TO BE DONE

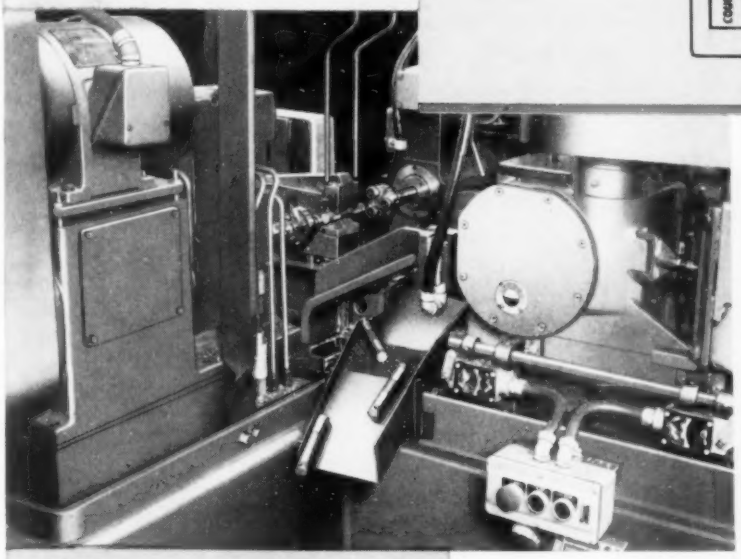


Part: Differential pinion shaft.

Operations: Countersink, drill, broach two sides, Triple-Chip cut off, and chamfer both ends.

HOW M & M DID IT BEST





M & M attained production of 300 pieces per hour at 100% efficiency.

Again, the one best answer is by a Motch & Merryweather in-line automatic transfer machine, designed and built for this one purpose. In-line speedy progression — no wasteful starting and stopping — stock clamping at each station — automatic stock bar loading can be added for complete automation. *Result:* rapid fire production that quickly pays out. This in-line machine is but one illustration of a production solution by Motch & Merryweather.

Ask us now for any production-machining aids. No obligation.

By combining operations, production was increased with a minimum of floor space and labor required.

THE MOTCH & MERRYWEATHER MACHINERY CO.

MACHINERY MANUFACTURING DIVISION

CLEVELAND 13, OHIO

Builders of Circular Sawing Equipment, also Production Milling, Turning, and Special Machines

We're Looking for Head Hunters!....

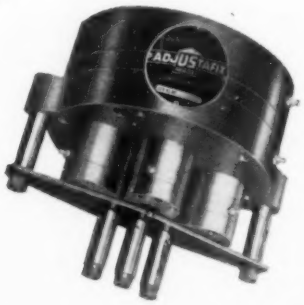
Most machine tool men have long relied upon the "US" Adjustable Multiple Spindle Drill Heads. But we are looking for those who still haven't tried them . . . and who are looking for the best.

With their quick-change universal joint assemblies, they are built for continuous use, with full anti-friction bearing construction for high capacity thrust loads. The universal joint adjustable multiple spindle type is suitable for any sensitive drilling machine. Joints are self-lubricating. All gears are hardened and shaved with spindles superfinished.

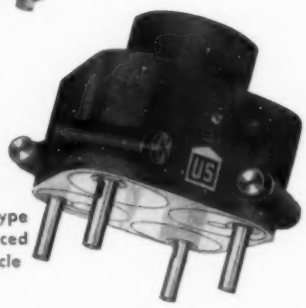
The single eccentric type is used for equally spaced holes on bolt circles.

The new double eccentric AdjUStafix, two to eight spindles, permits spindles to be located in non-symmetrical patterns. It eliminates expensive change in set-up.

Universal joint with slip spindle fixed locating plate



Double eccentric type for irregular spacing



Single eccentric type for equally spaced holes on bolt circle

Write for details on any type of universal joint adjustable head. Ask also about our totally enclosed gear-driven adjustable, fixed center, or individual lead screw tapping heads.

UNITED STATES DRILL HEAD COMPANY

616-618 BURNS STREET • CINCINNATI 4, OHIO

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[redacted] CO

AT [redacted]

PITMAN ARM TAPER SERRATIONS BROACHED & SWAGED IN SINGLE OPERATION ON 35 TON COLONIAL ASSEMBLY PRESS. 32 INTERNAL (36 INDEX) SERRATIONS, STARTING IN 1.005" ID HOLE, BROACHED & TAPER SWAGED IN 12" STROKE. PRODUCTION RATE 125 PER HOUR. WORKING SPEED 8 FT/MIN. STRIPPER PLATE HOLDS PART WHILE BROACH RETURNS AUTOMATICALLY. DEPTH OF SWAGE & TAPER SERRATION ACCURACY CONTROLLED BY ADJUSTABLE GUIDE BAR STOPS. THROAT OPENING REINFORCED BY EXTERNAL STRESS BARS TO MAINTAIN ACCURATE ALIGNMENT AT ALL OPERATING LOADS. REQUEST BULLETIN PA-52.

COLONIAL BROACH CO 1229P

WESTERN UNION TELEGRAM

WESTERN UNION TELEGRAM

ON

Note — Broach and Swage in one operation

PIONEERS OF H.S.S. BROACHING

COLONIAL

BROACH CO. DETROIT 13

UNIFIED BROACHING is the key to successful broaching

The *New* Rockwell-built

The Finest 11" Metal Cutting Lathe

Anywhere Near Its Price...

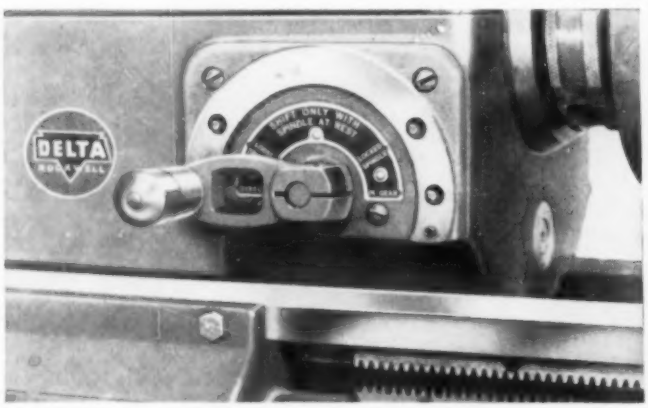
After five years of intensive development . . . after many months of testing under actual production line and tool room conditions . . . the new Delta 11" Metal Cutting Lathe is ready for you to see, to use, *to compare with any other metal lathe of comparable size.*

Into it has gone all of Delta's unsurpassed power tool experience, all of Delta's proven ability to build accuracy, ruggedness, and versatility into metal working machines. When you see it, you'll see why it's the finest 11" metal cutting lathe on the market today . . .

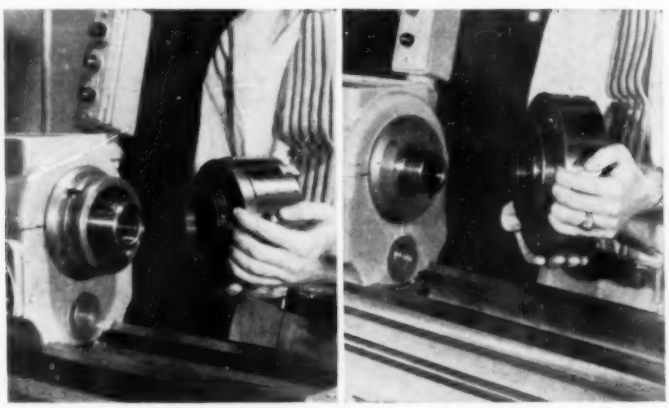
...With Quality Features Found In No Other Lathe *At Any Price!*

No other 11" metal cutting lathe, *regardless of price,* combines all of the precision, safety, and convenience features—all of the built-in Delta Quality "extras"—that you'll find in this great new lathe.

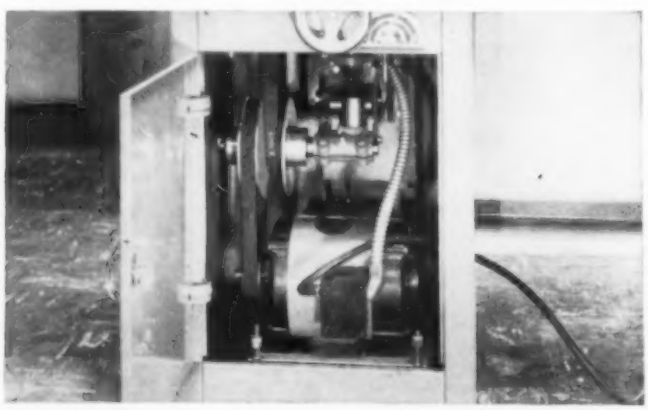
Only Delta gives you features like these:



EXCLUSIVE BACK GEAR SHIFT LEVER. Eliminates need for using wrenches, pulling out pins, or opening guards to shift from direct spindle drive to back gear spindle drive, loose or locked spindle.



CHOICE OF SPINDLE NOSES. Only Delta gives you choice of safe L-00 Tapered Key Drive or conventional 2¼"-8 Threaded Spindle Nose *at no extra cost.*



PERFECTED VARIABLE-SPEED DRIVE offers a speed range of 45 to 1550 rpm with an infinite choice in that range . . . *Plus* the high torque transmitting power of matched V-Belts. *No other lathe gives you this combination of power and convenience!*

SEEING IS BELIEVING...

There are many, many more outstanding new features, too many to list here. You've got to *see* this great new Delta Metal Cutting Lathe to really appreciate it. *Send the coupon for the name of the Delta Dealer nearest you who has this new lathe development on display and available for immediate delivery.*

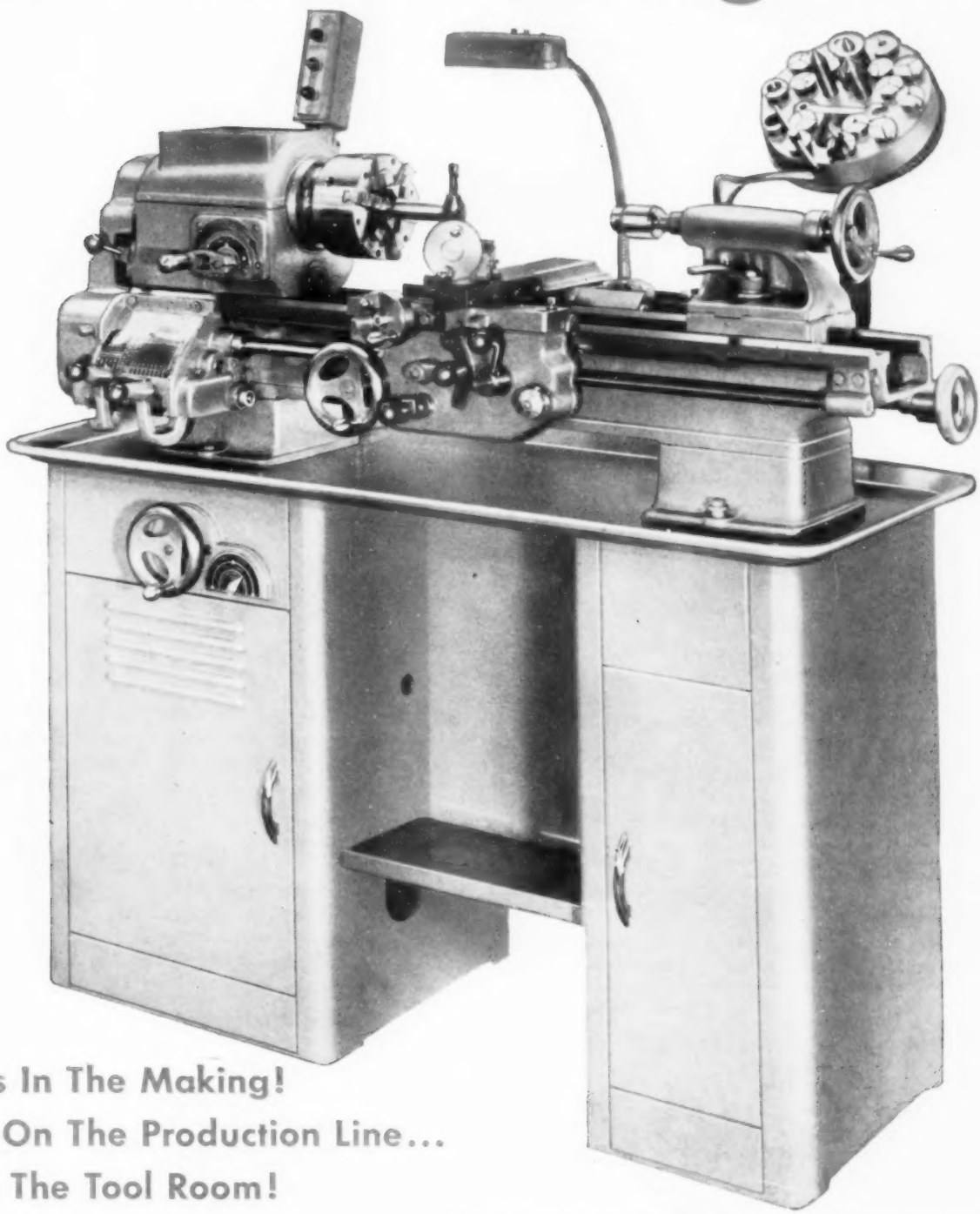
DELTA ROCKWELL **DELTA** QUALITY POWER TOOLS

Another Product by **Rockwell**

ROCKWELL

DELTA QUALITY COSTS NO MORE

DELTA Metal Cutting Lathe



5 Years In The Making!
Tested On The Production Line...
And In The Tool Room!

DELTA 11" METAL CUTTING LATHE. Cabinet model. Variable speed drive with 24" capacity center to center, and 1" collet capacity. Diameter of hole through spindle, 1⅜". Choice of 2¼"-8 threaded spindle nose or L-OO Tapered Key Drive spindle nose, at no extra cost. Full line of accessories available, including new telescopic taper attachment with magnifying lens and micrometer adjustment; also micrometer carriage stop, milling attachment, and a complete line of standard accessories now available. Send coupon for complete information.

Send This Coupon For Free Catalog!

Delta Power Tool Division, Rockwell Manufacturing Company
620D N. Lexington Ave., Pittsburgh 8, Pa.

☐ Please send name of my nearest Delta Dealer who has the new Delta 11" Metal Cutting Lathe under power.

☐ Please send me catalog information on new Delta 11" Metal Cutting Lathe.

Name _____ Title _____

Company _____

Address _____

City _____ County _____ State _____

Talking About Die Sets

WITH

PHIL MARSILIUS

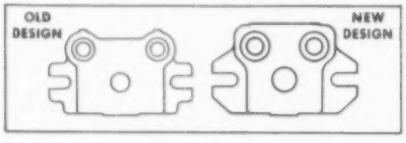
Vice-President
The Producto Machine Co.

9 Ways to Save on Special Steel Die Sets—Here are some suggestions that can save you money on machine work and shorten delivery time when you order special steel die sets: 1. Specify flame-cut edges, rather than machined edges, where possible. 2. Where close limits are not important, flame-cut clearance holes or cut-outs should be specified. Unnecessary machining increases cost. 3. For cut-outs requiring more accuracy than flame-cutting but less than machining, specify "saw-cut" to keep costs down. 4. On all types of cut-outs, keep radii in corners as large as possible.

5. Try to keep hole location tolerances as liberal as possible to reduce machining time. 6. On pin supports or bushing supports, welded construction is less expensive than dowelled and bolted construction. 7. On hold-down pads or flanges, the clamping slots should be flame-cut. 8. Bolt slots machined in pads should have one radius on the inside instead of two small radii corners. 9. Avoid special pins or bushings wherever possible.

★ ★ ★

A New Look in Die Sets—In case you haven't noticed, there's a new look in die sets. The new design offers these improvements: much more layout and mounting area on punch holders and die holders; maximum strength;



assurance of uniformly accurate location of pin and bushing holes. In addition, we felt that clean lines designed into a set would show the tooling to better advantage and make the completed unit look more like the precision instrument it really is. So you see, a die set can now make your work easier and your product better looking.

★ ★ ★

Proper Lubrication of Die-Set Pins and bushings helps to prevent seizing and galling, adds substantially to the life of your die sets. A new flexible reservoir type lubricator has been developed for this purpose. The guide bushings dip into the reservoir with each down stroke of the press, coating the entire pin with lubricant on the return stroke. It's an inexpensive way to get thorough lubrication for long periods of time without need of constant attention. Other lubrication methods will be discussed at a later date.

One of many major foundry improvements at Producto is this new continuous-pour operation which also provides continuous slag removal. The 12,000-lb. die set shown below is an example of the top-quality sets obtainable through Producto's "under-one-roof" service—pattern, casting and machining.

WHERE A BETTER DIE SET STARTS

Producto's newly-modernized foundry enables you to get higher-quality die sets...faster.

So extensive have been foundry improvements at Producto that little of the equipment or methods of two years ago remains. A new and larger cupola, stack, slag disposal unit, continuous-pour ladle, abrasive cleaning machine, sand conditioner, and conveyor systems for sand and molds have been installed.

FOR YOUR DIE SET REQUIREMENTS, THIS MEANS YOU GET:

HIGHER QUALITY sets, since Producto can produce a laboratory-controlled iron and steel mixture free of hard spots and blow holes.

FASTER SERVICE on catalog semi-steel sets, because combination of internal foundry and machine shop makes possible a full inventory at all times. Time from order to shipment never exceeds three days.

FASTER SERVICE on special semi-steel sets. A modern pattern shop in the plant expedites making patterns for your specials. No dependency on outside suppliers.

The improved foundry is but one of the reasons more and more die set users are specifying Producto. For precision die sets fast, call your nearest Producto branch.

THE PRODUCTO MACHINE COMPANY
930 Housatonic Avenue, Bridgeport 1, Connecticut

For prompt die set service, 'phone these PRODUCTO assembly warehouses:

Atlanta	CY 7667	Detroit	LI 6-7600	New York	WO 4-7484
Chicago	ES 8-3307	Kansas City	VI 1162	Philadelphia	MO 4-1010
Cleveland	SU 1-6158	Los Angeles	TR 9826	Rochester	GL 1810
Dayton	MU 1651				

★ or check the Yellow Pages in any stamping center in the United States or Canada for distributors stocking PRODUCTO.

Produce More With PRODUCTO ***Die Sets***

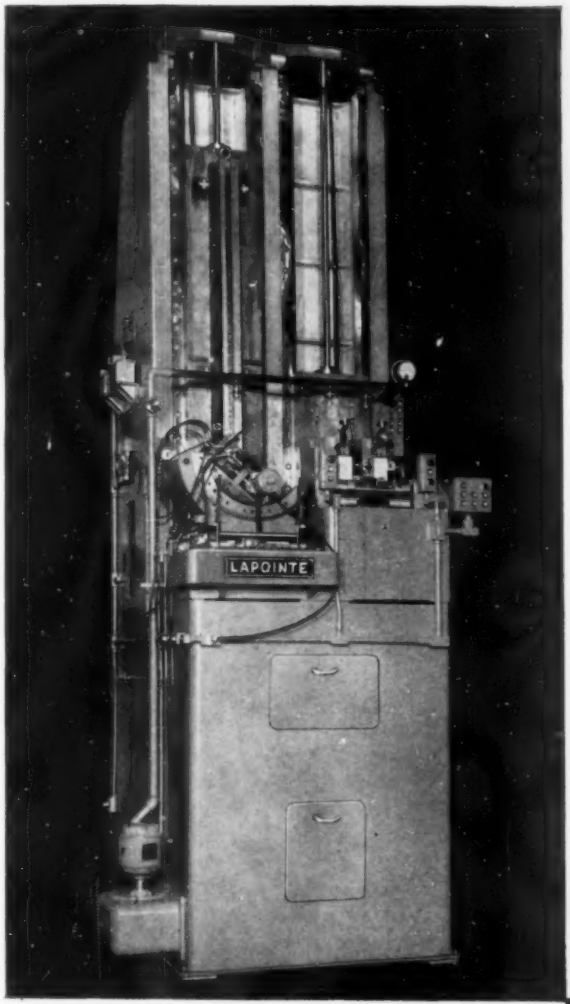
this double-ram vertical

LAPOINTE BROACHING MACHINE

with electro-mechanical drive

lends itself to carbide tooling because of its

higher speed ranges



here's BROACHING EFFICIENCY at its best!

Simultaneous broaching of rotor wheel slots and mating buckets (the latter requiring two progressive operations).

. . . that's balanced production!

125 broaching cycles per hour, at 80% efficiency, producing these parts faster than by any other known method.

. . . that's volume production!

No loss through rejections, because all parts are formed perfectly and to the close tolerances required of jet engine components.

. . . that's quality production!

One operator easily and safely handles this double ram machine, loading one ram while the other ram is broaching.

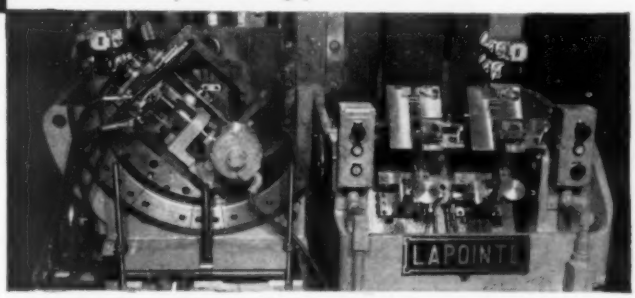
. . . that's efficient production!

FOR 53 YEARS LAPOINTE has been designing, engineering, and building broaching machines, tools and fixtures. That's all we do. It's no wonder that production men most naturally look to Lapointe to solve any broaching problem.

TWO UNIQUE FIXTURES

make this high production possible, the Lapointe IN-and-OUT self-indexing type for the rotor wheel slots (see ram on left), and the TIP-DOWN type for the mating buckets (see ram on right). The Tip-Down type fixture is exclusive with Lapointe.

If you would like a description of this LAPOINTE double-ram vertical broaching machine ask for Bulletin DRVE-5



THE LAPOINTE MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U. S. A.

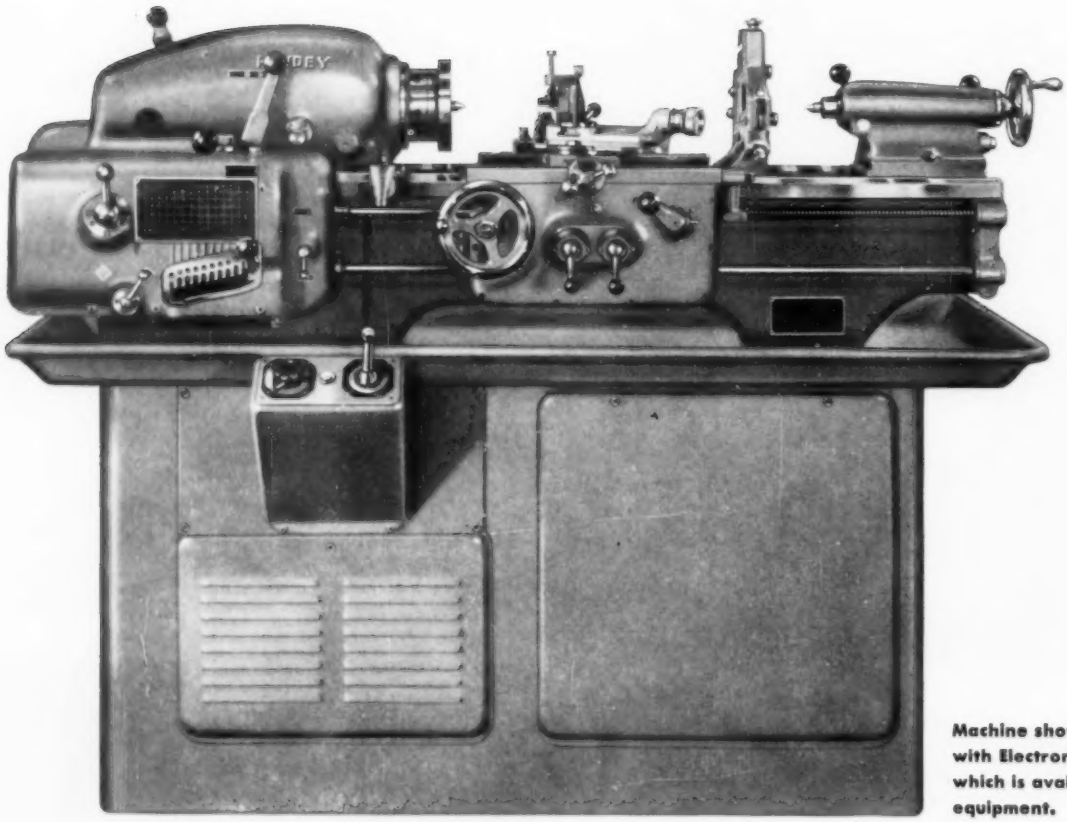
In England: Watford, Hertfordshire

HUDSON LAPOINTE MASS

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

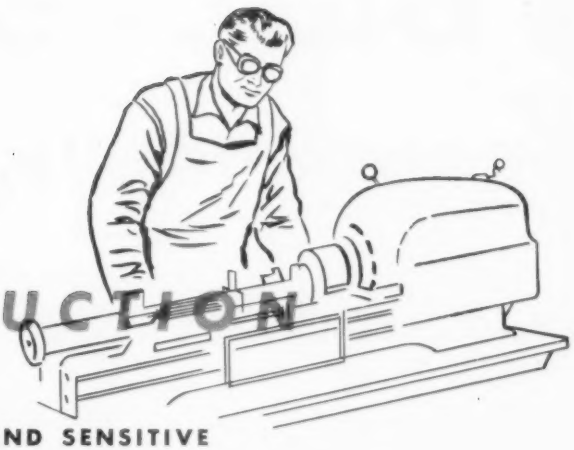
Hendey TOOL and GAGE MAKERS LATHE

for PRECISION HIGH S



Machine shown is equipped with Electronic Speed Control which is available as extra equipment.

TOPS IN ACCURACY . . . HENDEY PRECISION-BUILT M



SPEED PRODUCTION

HEAVY DESIGN,
HIGHLY ADAPTABLE AND SENSITIVE
FOR PRECISION WORK AT HIGH SPEEDS.

The Hendey 9" x 24" Tool and Gage-Makers Lathe provides maximum precision and versatility for tool-room and production use. Some of the features of the standard machine include:

Infinitely variable spindle speeds to 3000 RPM
Convenient operation
Hardened and ground V ways
66 quick-change thread cutting and feed changes
Pre-loaded, super-precision, anti-friction spindle bearings
Precision lead screw
Feed shaft independent of lead screw
10¼" swing over ways — 24" Center distance

As extra equipment, this lathe can be furnished with an electronic speed selector for maximum sensitivity of spindle speeds and for full torque at low speeds. Speeds are infinitely variable and can be changed smoothly and easily while under load.

Whatever your toolroom and production problems may be, investigate the 9" x 24" Tool and Gage-Makers Lathe. Call your nearest Hendey representative, or write for bulletin.

See It In Action! Booth No. 221.

THE MACHINE TOOL SHOW
CHICAGO, ILL.
SEPT. 6-17, 1955
INTERNATIONAL AMPHITHEATRE

MACHINE TOOLS *Hendey* machine division
BARBER-COLMAN COMPANY
211 LOOMIS ST., ROCKFORD, ILLINOIS

BARBER COLMAN

die blocks accurately a

economically shaped...

on a CINCINNATI SHAPER

at the **DROP DIES AND FORGINGS CO.,** Cleveland, Ohio

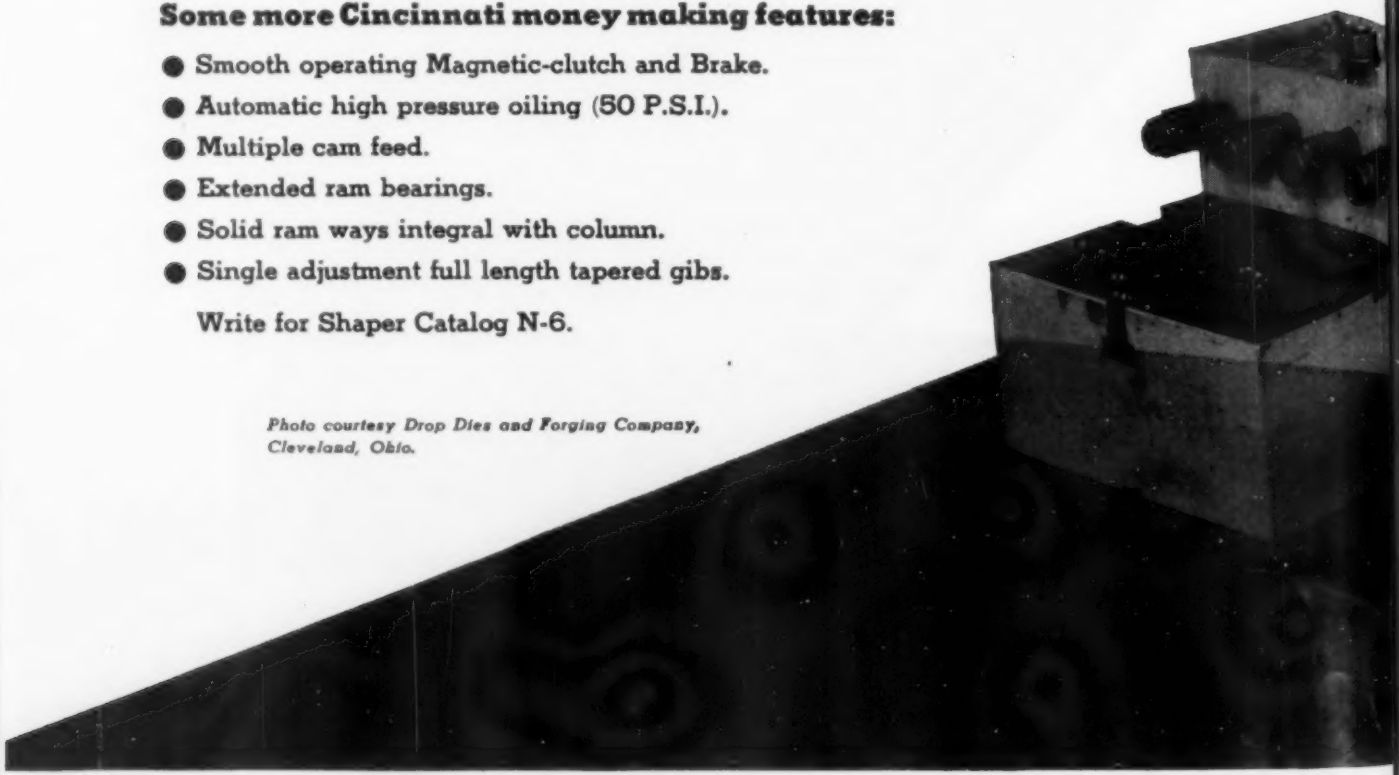
Accuracy and convenience make money for this customer. This accurate Cincinnati Shaper and the convenient special die block vise are factors in this economy.

Some more Cincinnati money making features:

- Smooth operating Magnetic-clutch and Brake.
- Automatic high pressure oiling (50 P.S.I.).
- Multiple cam feed.
- Extended ram bearings.
- Solid ram ways integral with column.
- Single adjustment full length tapered gibs.

Write for Shaper Catalog N-6.

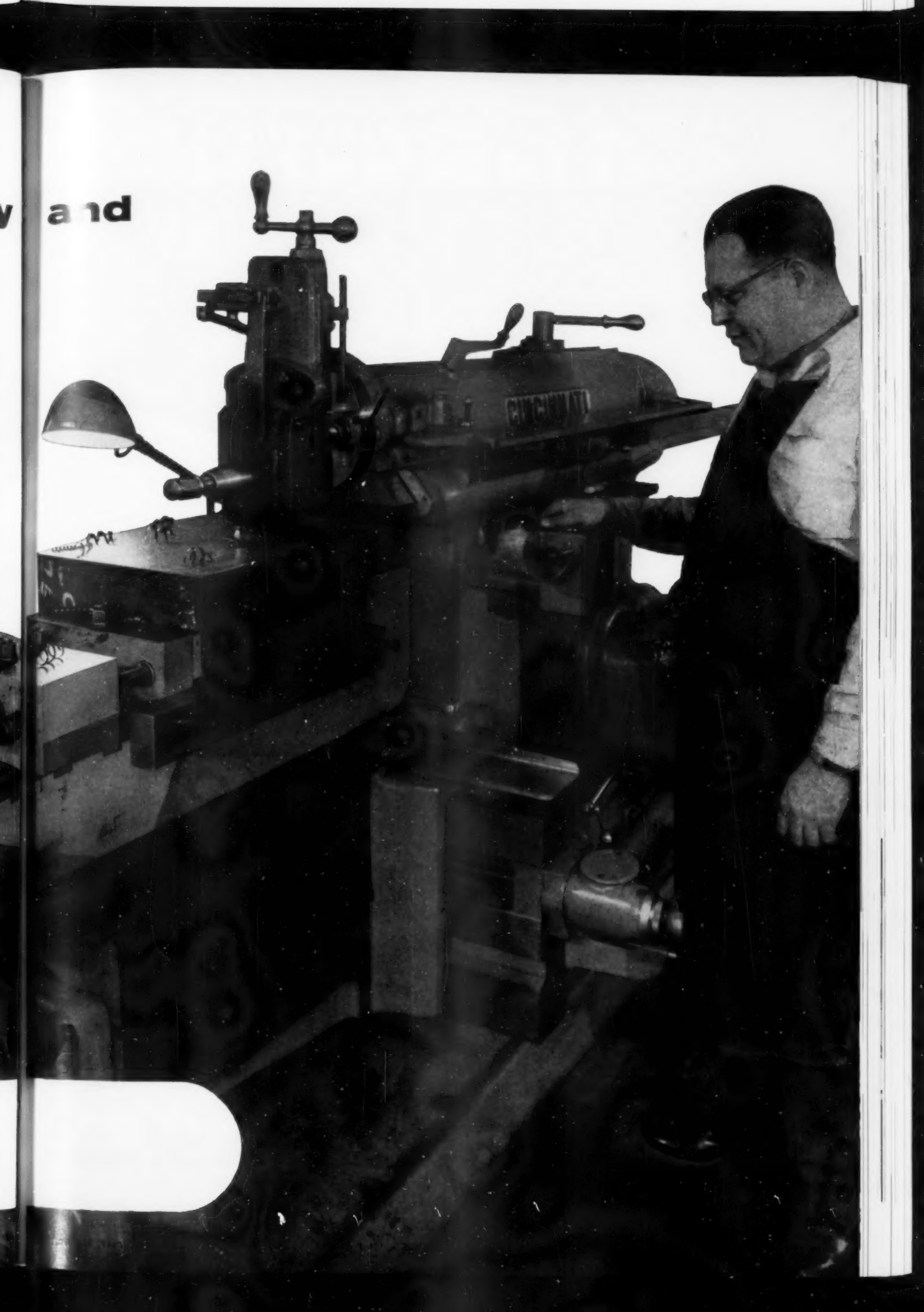
Photo courtesy Drop Dies and Forging Company, Cleveland, Ohio.



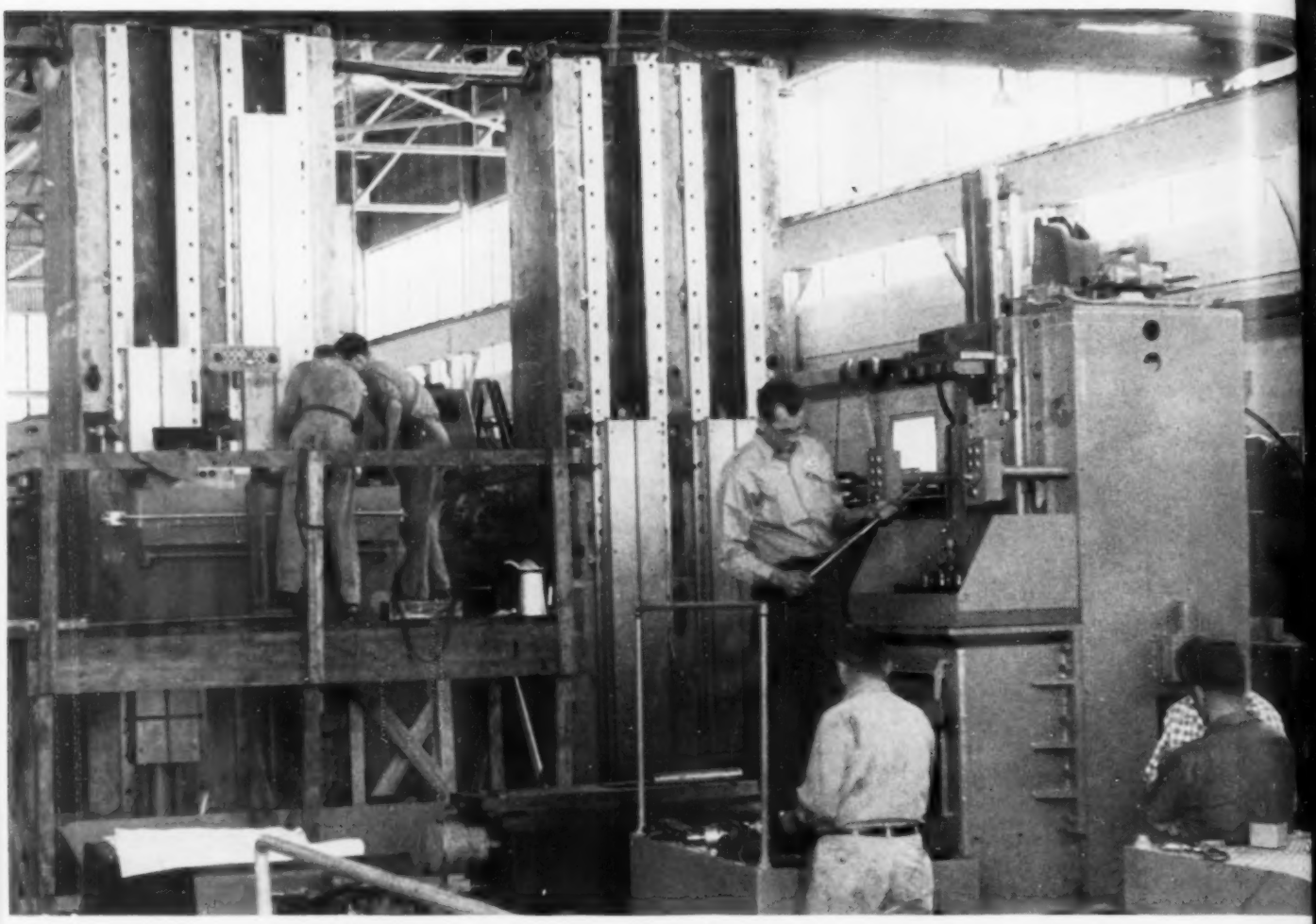
CINCINNATI

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES


y and

Years of Broaching Experience



Now Applied to Building
THE FINEST IN BROACHING MACHINES

Detroit Broach is in the machine tool business!

It was a logical step for Detroit Broach to move into this activity. Here is a company that is known throughout the world as a pioneer and leader in the design and manufacture of broach tooling. The engineering abilities that have built this reputation, and the knowledge gained through the application of the tooling to machines of every make and model, are reflected in these new machines which are already demonstrating exceptional production efficiency in broaching. Incorporating proven features—such as Oilgear hydraulic equipment—with many advanced design ideas, they are establishing new standards in the broaching machine field.

Today, Detroit Broach offers you the "complete package" in broaching . . . from a single broach to a completely tooled machine . . . produced to meet *exactly* every requirement for accurate, trouble-free performance.

4281

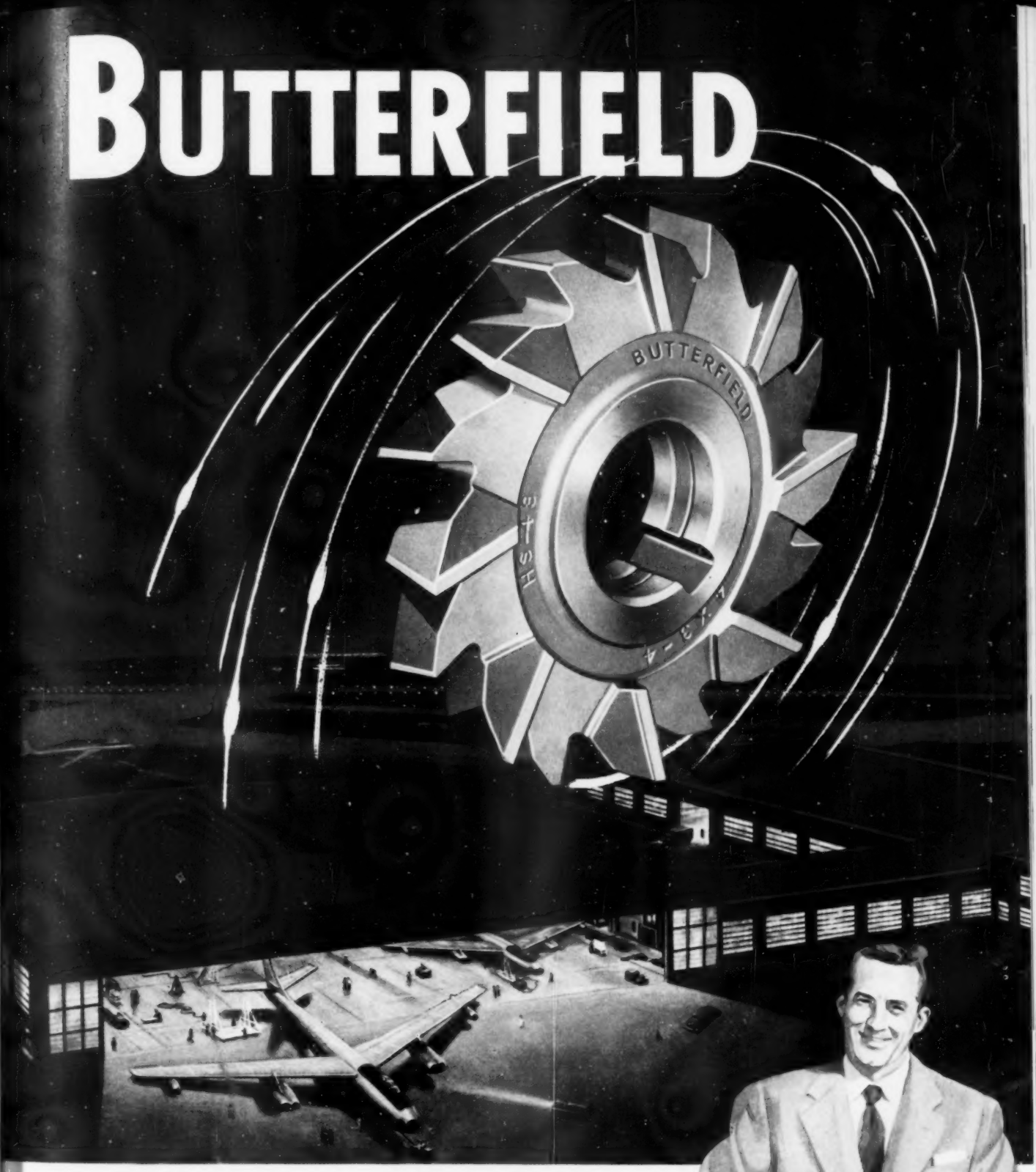
WHATEVER YOU
NEED IN BROACHING
DETROIT BROACH
CAN SUPPLY IT

Detroit Broach COMPANY

ROCHESTER, MICHIGAN

OFFICES IN PRINCIPAL CITIES THROUGHOUT THE WORLD

BUTTERFIELD



A COMPLETE LINE OF QUALITY cutting tools is now available from your Butterfield distributor. Milling Cutters are made to the same exacting standards as Butterfield Taps, Dies, Drills, Reamers, Counterbores and End Mills.

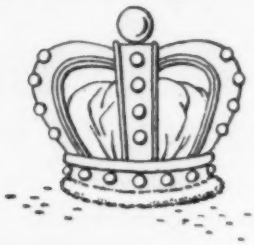
UNION TWIST DRILL COMPANY
BUTTERFIELD DIVISION
DERBY LINE, VERMONT, U. S. A.

FOR FAST, ECONOMICAL SERVICE
CALL YOUR **BUTTERFIELD**
DISTRIBUTOR

Carbide grinding's

Norton Vitrified Bonded Diamond Wheels feature fast stock removal and high resistance to grooving. Long service life is another big advantage, since this Norton-developed bond holds each diamond tightly, for maximum useful cutting action. *Typical Applications:* production grinding of single-point carbide tools; grinding chip breakers; cylindrical, surface and internal precision grinding of carbide tools, cutters, discs, gages, rolls, etc.

Norton Resinoid Bonded Diamond Wheels are made in two bond types — regular, for wet grinding and B6, for dry grinding. Each type gives you extra fast cutting action and long, money-saving wheel life. *Typical Applications:* grinding multi-tooth cutters, where their size-holding ability assures uniform height to each cutter tooth; cutting-off damaged carbide tools for salvage; grinding threads "from the solid" in carbide taps and thread gages.



"CROWN JEWELS"

Norton diamond wheels bring unbeatable economy to your production

You buy diamond wheels for carbide grinding as an investment in faster, better grinding performance and lower production costs.

You can be sure of peak profits from this investment when your choice is Norton diamond wheels. Backed by Norton's long leadership in development and manufacture — and by news-making "firsts" in diamond wheel progress — they're carbide grinding's recognized "Crown Jewels", with a royal reputation for the best in diamond wheel value!

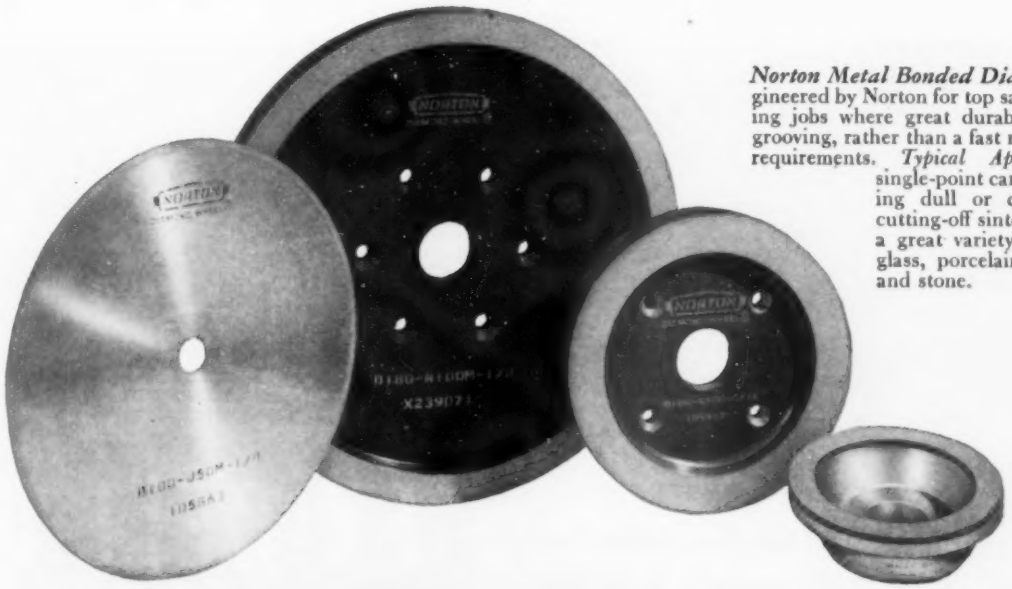
"CROWN JEWEL" Highlights

NORTON: was first to introduce resinoid, metal and vitrified bonded diamond wheels . . . does all its own sizing, grading and laboratory checking of diamonds . . . duplicates wheel specifications with constantly controlled accuracy, to assure you uniform top performance . . . brings you a complete line, covering every diamond wheel application in every field — carbide, stone, glass, ceramics, etc. . . . gives you fast service from full stocks in Worcester, five warehouses and Distributor's stocks.

Your Norton Distributor

is ready with quick deliveries of the diamond wheels you need for better, more economical carbide grinding. Ask him for the 142-page illustrated booklet, *Grinding Carbide Tools,* and the complete net priced Diamond Wheel Catalog or write for them direct. And remember: only Norton offers you such long experience in both grinding wheels and machines to help you produce more at lower cost. NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your phone directory, yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

Making better products . . . to make your products better



Norton Metal Bonded Diamond Wheels are engineered by Norton for top savings on certain grinding jobs where great durability and resistance to grooving, rather than a fast rate of cut, are the chief requirements. *Typical Applications:* sharpening single-point carbide tools; reconditioning dull or chipped carbide tools; cutting-off sintered carbide blanks and a great variety of other materials — glass, porcelain, germanium, cermets and stone.

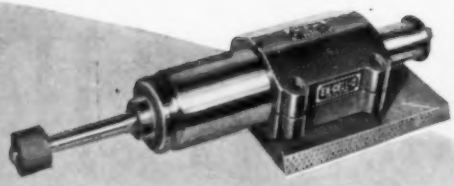
W-1614

NORTON

and its BEHR-MANNING division

NORTON: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

Grinding small holes with an Ex-Cell-O 25,000 RPM High Frequency Motorized Spindle



THE MACHINE TOOL SHOW
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Single-body, belt-driven internal grinding spindle.

Double-body, belt-driven internal grinding spindle.

25 hp heavy duty precision spindle with 24" grinding wheel.

PRECISION SPINDLES

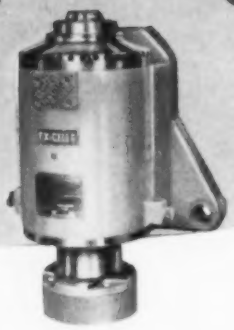
Built for Your Work

25,000 rpm high frequency inbuilt motor spindle.

Totally enclosed inbuilt motor surface grinder spindle.

Precision inbuilt motor spindle for cutter grinder.

Heavy duty motorized precision spindle available up to 20 hp



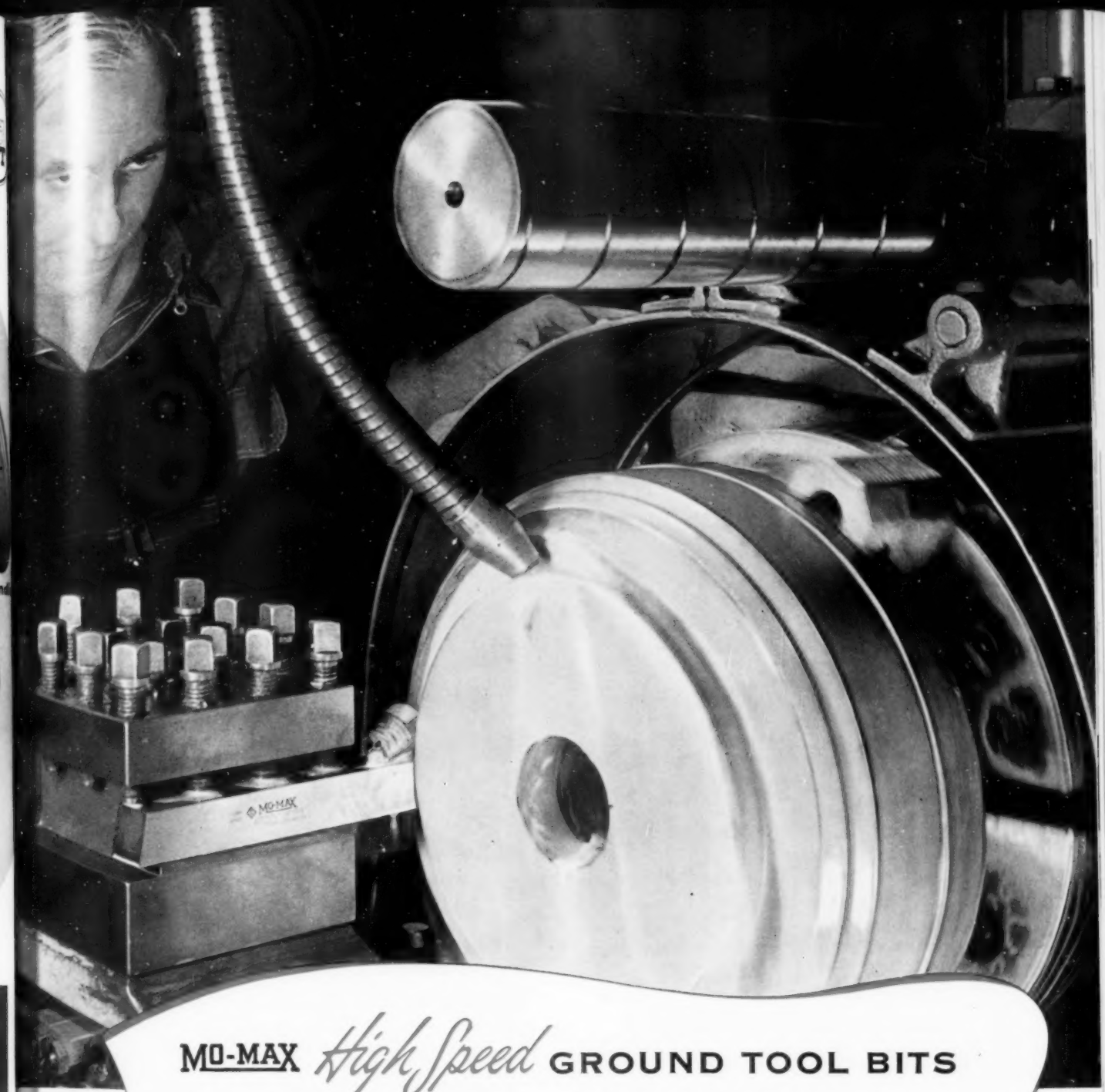
Get the most from your precision grinding operations by using the Ex-Cell-O Spindle that's made especially for the job.

Ex-Cell-O Precision Spindles have long been the original equipment choice of leading grinder manufacturers. They are rigid and smooth-running. For high precision work they are fitted with standard Ex-Cell-O Precision Ball Bearings; for slower speeds and heavier cuts they are equipped with heavy-duty Ex-Cell-O Precision Ball Bearings. They require no lubrication or adjustment. Phone your Ex-Cell-O representative or write to Ex-Cell-O in Detroit today for catalog 25962 listing hundreds of standard grinding spindles.

XLO
EX-CELL-O for PRECISION

EX-CELL-O
CORPORATION
DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT



MO-MAX *High Speed* GROUND TOOL BITS

Tough and Rugged, with Superior Cutting Qualities

MO-MAX and MO-MAX COBALT Tool Bits have been used economically for many years in thousands of plants... under all conditions. Without exception they have proved conclusively that they perform better than other high speed steels. Try the MO-MAX brand on your next job.

THE **CLEVELAND** TWIST DRILL CO.
1242 East 49th Street • Cleveland 14, Ohio
Stockrooms: New York 7 • Detroit 2 • Chicago 6 • Dallas 2 • San Francisco 5 • Los Angeles 58
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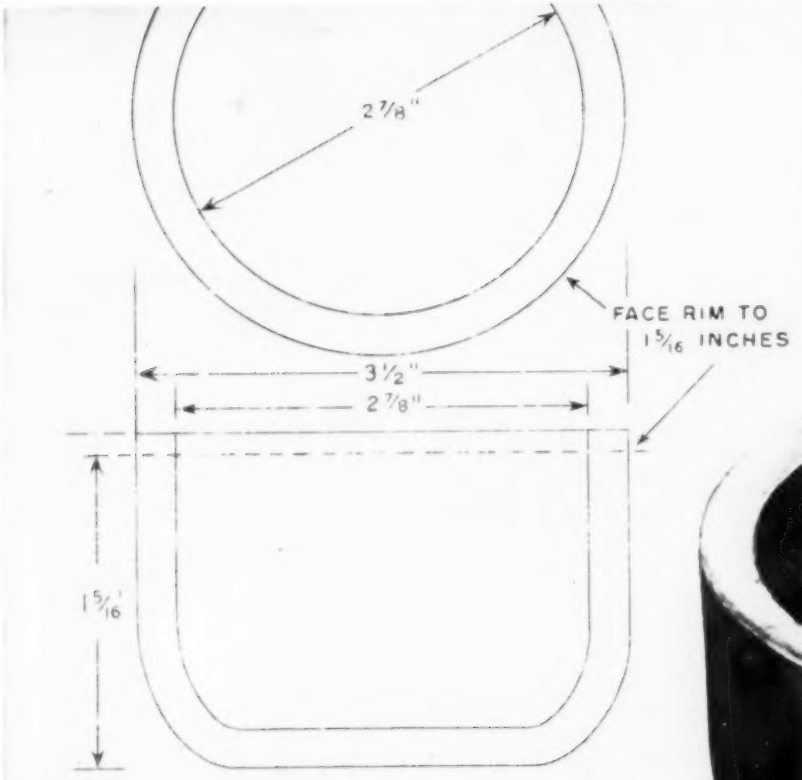
TELEPHONE YOUR INDUSTRIAL SUPPLY DISTRIBUTOR



PRODUCTION DATA

Material	SAE 1020 Steel
Stock Removal	1/8 in.
Speed	500 S.F.P.M.
Feed	0.006 in. per rev.
Coolant	None
Tools	HAYNES STELLITE 98M2 alloy

1,000 PIECES ▸ MACHINED PER GRIND ...despite rough, uneven cut

HAYNES STELLITE 98M2 tools machine over a thousand of these torque converter cups between grinds. The cups are deep drawn from SAE 1020 steel, and are plunge cut. The area to be machined is rough and uneven. The HAYNES STELLITE tools operate for a full eight-hour shift, at a speed of 500 surface feet per minute, without chipping or spalling. No coolant is used.

HAYNES STELLITE tools are successful on applications like this one because they have good impact strength, high compressive strength, and their cutting edges remain hard and sharp even when red hot. This same combination of properties makes them valuable on all machining jobs. They remove metal fast. They can be used at high speeds with comparatively high feed rates, and they can take deep cuts.

For information on how HAYNES STELLITE tools can help speed up your machining jobs, write for the booklet, "HAYNES STELLITE Metal-Cutting Tools." It gives helpful information on chip formation, tool design, and the machinability of metals.

HAYNES TRADE-MARK ALLOYS

HAYNES STELLITE COMPANY

A Division of Union Carbide and Carbon Corporation

UCC

General Offices and Works, Kokomo, Indiana

Sales Offices

Chicago · Cleveland · Detroit · Houston · Los Angeles · New York · San Francisco · Tulsa

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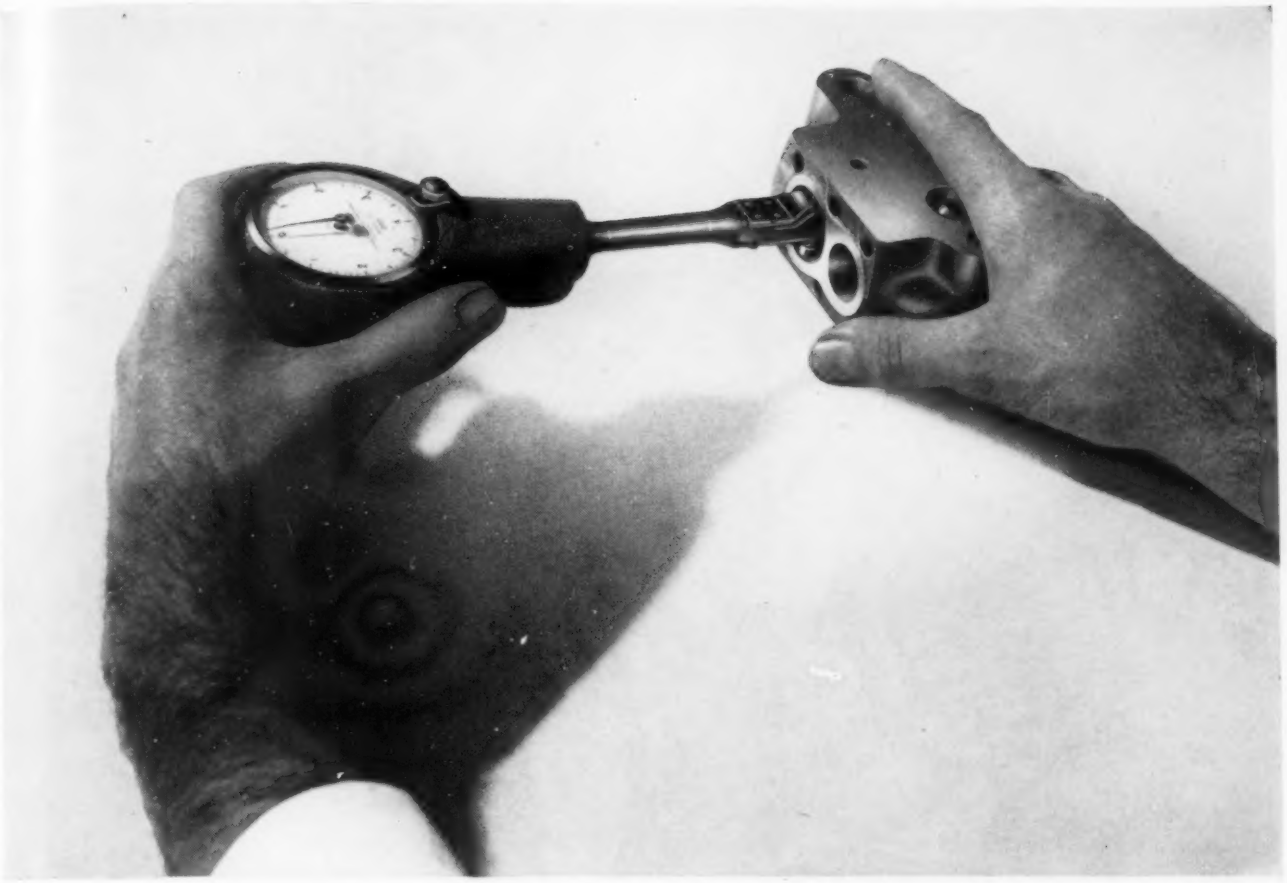


Just How Accurate Must A Gage Be To Be Accurate?

Precision is relative. A specified dimension of 1.625" is never exactly 1.625" on the workpiece. That's why you use tolerances.

You use gages to find out how closely your work comes to the specification 1.625". But, gages themselves can also vary in their accuracy. So *they* need tolerances, too.

And that is what we want to talk about. We put tolerances on the accuracy of the gages we make. We make them to an accuracy standard that experience indicates is "high grade" and acceptable to those who have a "high grade" regard for the dimensional quality of their products. We also build into them a durability that makes sure that our gages will maintain that accuracy standard for a long, long time.

For instance, some gage users would specify steel contacts on a gage like that shown above. We *can* supply steel contacts but *our* standard of accuracy calls for contacts of the hardest material — diamond. Why? Because the minute you start to use a gage the contacts begin to wear. You may have saved a few dollars on the soft contacts but soon the gage begins to change its accuracy. You have to check it oftener and reset it. If you forget, you are soon passing out-of-tolerance work. Another example: The above gage could be made to centralize itself positively, but it would not gage as accurately.

These are only two illustrations. We know that accurate gages require certain basic fundamentals in their design. — Moreover, they should not be "multi-purpose" or Rube Goldberg gages difficult to adjust and of doubtful accuracy.

We *know* these things are true. That's why Federal insists on adherence to *proven* principles of gage design.

Ask our Engineers for recommendations to meet your gaging requirements.

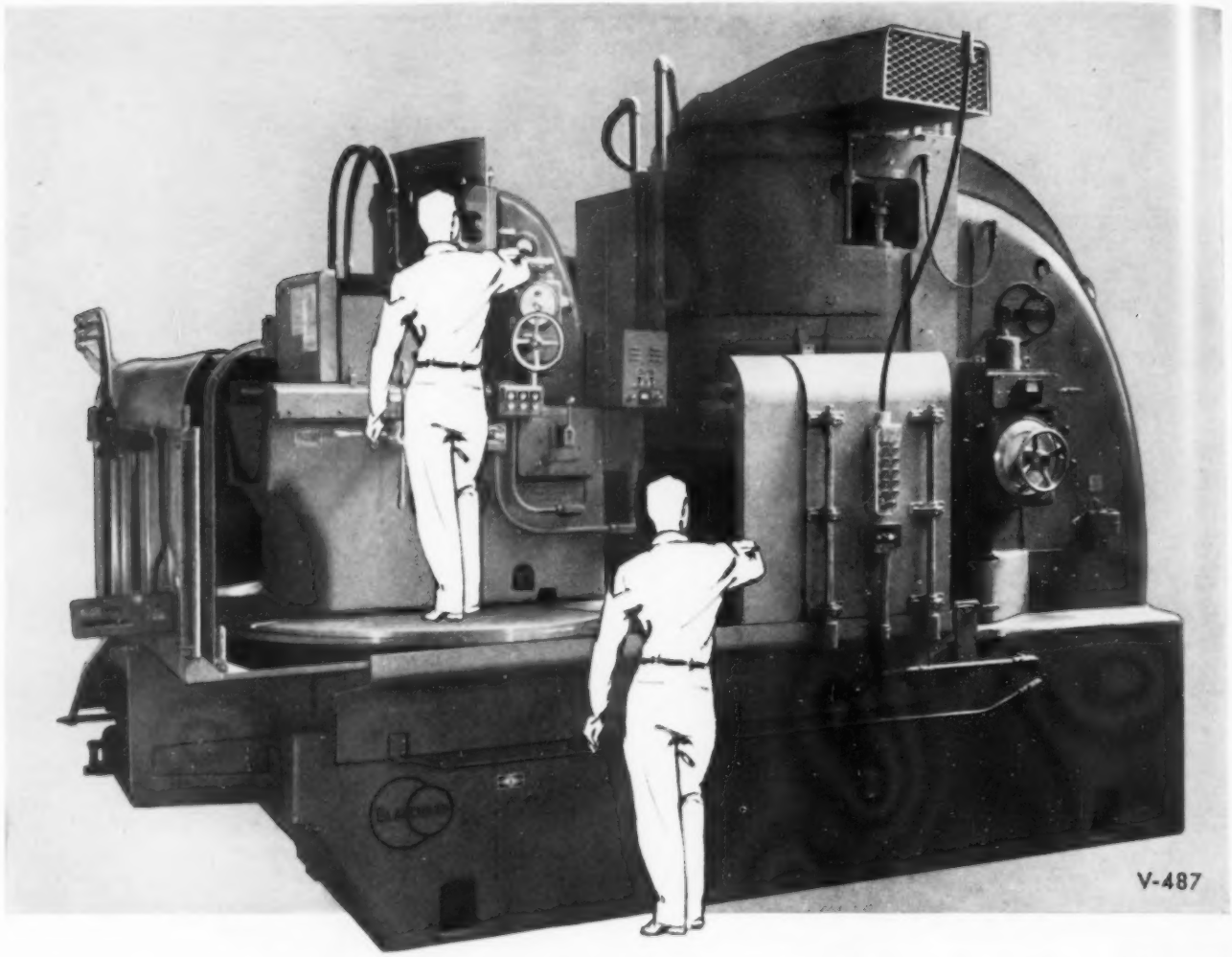
FEDERAL PRODUCTS CORPORATION

5194 Eddy Street, Providence 1, R. I.

Ask **FEDERAL**

FOR ANYTHING IN MODERN GAGES...

Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring, Sorting, or Automatically Controlling Dimensions on Machines



WE PUT ONE BLANCHARD ON ANOTHER

. . . to show you the wide range of sizes!

It's true! There's no "trick" photography involved. Our 5,400-lb. No. 11 Blanchard Surface Grinder fits snugly on the 84" chuck of our giant 61,000-lb. No. 42-84. And, like all Blanchards, both have chucks flat within .0002" – guaranteed!

Do every surface grinding job in your shop *perfectly* . . . whether you grind tiny watch parts – steel plates 7 feet across corners – or anything in between . . . *put it on a Blanchard.*

Whatever your requirements for stock removal, tolerances or surface finish, ask for details on the 15 standard Blanchard models today. One of them will fill your needs perfectly and will do your work with speed and precision – at costs which help you set competitive prices.

Send for your free copies of "Work Done on the Blanchard", fourth edition, and "The Art of Blanchard Surface Grinding".

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY 64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.

STANDARD TOOL

...serving Industry since 1881

• The Standard Tool Man, Serving Industry Since 1881, can recommend the correct tap, grind and speed that will enable you to reduce your production costs. Find out how his broad experience on metal cutting can help you. The Standard Tool Man is always at your service without obligation.

Call him!

Complete line . . . stocked by the Standard Tool Distributor in your area

STANDARD TOOL CO.

3950 CHESTER AVENUE CLEVELAND 14, OHIO

FACTORY BRANCHES IN: NEW YORK • DETROIT • CHICAGO • DALLAS • SAN FRANCISCO

THE STANDARD LINE: *Twist Drills · Reamers · Taps · Dies · Milling Cutters · End Mills · Hobs · Counterbores · Special and Carbide-Tipped Tools*

You have got to *SEE* the outstanding new aluminum oxide M.M. Process Wheel in action to *BELIEVE* the amazing results it can accomplish for you, in grinding those "hard to grind" materials.

The self dressing qualities of this now famous M.M. Process are available to you in aluminum oxide abrasive. You too can now have the cost saving advantages of this cool cutting wheel.

Call your Macklin distributor today to arrange for a demonstration.

MACKLIN GRINDING WHEELS

Write for complete information to Dept. 32

MACKLIN COMPANY

***Manufacturers of* GRINDING WHEELS AND OTHER ABRASIVE PRODUCTS**

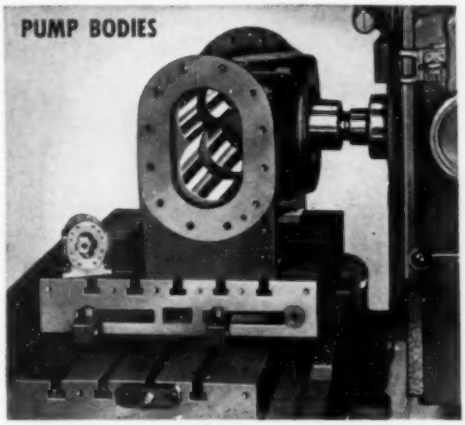
JACKSON, MICHIGAN

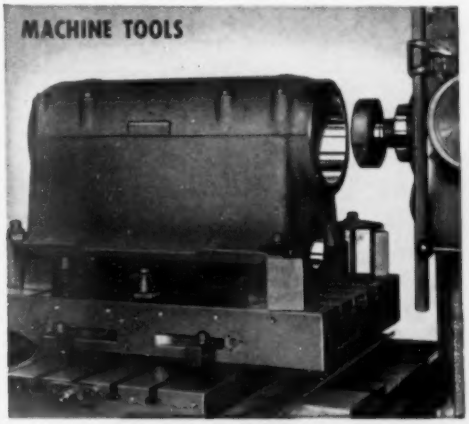
There is a MACKLIN Field Engineer in your vicinity. MACKLIN distributors are located in all principal cities, with ample stocks to fill your needs.

The De Vlieg System of

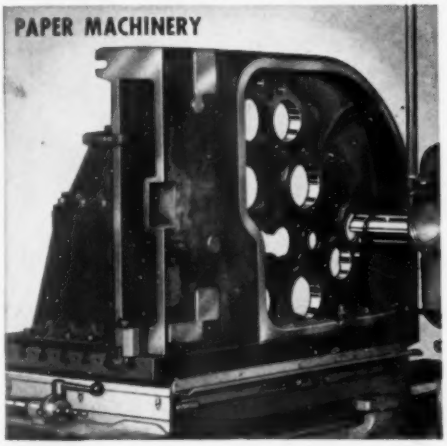
*JIGLESS PRODUCTION

. . . eliminates expensive boring jigs!





TYPICAL EXAMPLES OF JIGLESS PRODUCTION ON DE VLIEG JIGMILS



The JIGMIL Technique:

ELIMINATES SPECIAL BORING JIGS

REDUCES MACHINING TIMES

PERMITS USE OF SIMPLIFIED TOOLING

IMPROVES ACCURACY WITH RESULTANT CUT IN ASSEMBLY COSTS

The De Vlieg System of Jigless Production permits complete flexibility of product design!

If your shop is burdened with costly boring jigs and special tooling, it will pay you to investigate the

DE VLIEG *SPIRAMATIC* JIGMIL

Come to Detroit—

see a practical demonstration of the JIGMIL TECHNIQUE

Write for comprehensive Illustrated Catalog

450 Fair Ave., Ferndale • Detroit 20, Mich.

BUTTONING UP THE JOB PROPERLY. UNBRAKO Button Head Socket Screws, of course, provide a smooth, streamlined surface. They are strong, too. But equally important is the ease with which they can be inserted and withdrawn without marring the socket of the screw or the surface of the assembly. For the complete UNBRAKO story, see your authorized industrial distributor. Or write to STANDARD PRESSED STEEL CO., Jenkintown 37, Pa.

UNBRAKO® SOCKET SCREW DIVISION SPS JENKINTOWN, PENNSYLVANIA

Presenting... the NEW

tri-D MILLING HEAD
KEARNEY & TRECKER MILWAUKEE

adaptable to almost all horizontal and some vertical milling machines ... regardless of make

The new TRI-D Milling Head is the latest addition to Kearney & Trecker's outstanding Rotary Head milling family. TRI-D is designed for quick, easy mounting on practically all horizontal and some vertical milling machines.

The TRI-D Milling Head can produce almost any geometric shape in metal employing straight lines, radii or angles — all in a single set-up. Power is transmitted to the spindle through a heavy-duty flexible shaft driven by the machine spindle or a separate variable speed motor unit.

TRI-D's matchless technical perfection brings to metal cutting an insured investment equalled by no other single element of production. Find out how you can increase production and cut milling costs with this new milling head. Your Kearney & Trecker representative will be pleased to give you all the details. Contact him today, or write Kearney & Trecker Corporation, Milwaukee 14, Wisconsin.

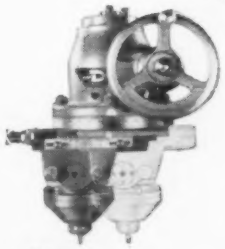
THE MACHINE TOOL SHOW
CHICAGO, ILL.
SEPT. 8-17, 1959
BOOTH NO. 508

Pat. No. 2286821
other Pat. Pend.

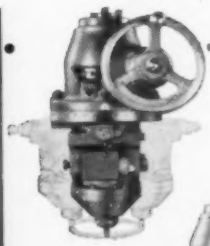
Kearney & Trecker
CORPORATION
MILWAUKEE 14, WISCONSIN

KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

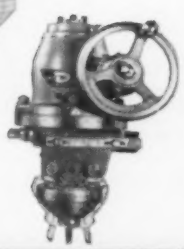
Only tri-D has all 3 . . .



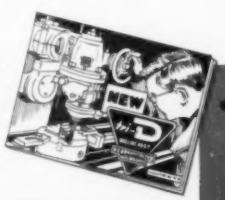
1. LATERAL ADJUSTMENT of the cross-slide permits off-setting the spindle up to 2½". A large dial, graduated in thousandths, is mounted on the cross-slide screw. Precision-ground screw assures the ultimate in accuracy and long life. A friction lock secures cross-slide position.



2. ROTARY MOVEMENT of the head through a complete circle, or any specific part, is easily accomplished by turning handwheel in either direction. Combined with lateral adjustment of the cross-slide, this rotary movement permits milling of circles up to 5" in diameter.



3. ANGULAR ADJUSTMENT of cutter, an exclusive feature, is the swivel block which permits positioning of the cutter at any angle in the vertical plane, up to 15°, either side of center. Easy-to-read graduations make setting to a precise angle a very simple operation.



Kearney & Trecker Corporation
6784 W. National Avenue
Milwaukee 14, Wisconsin

Please send me catalog No. TD-10 with details on new TRI-D Milling Head.

Name .....
Title .....
Company .....
Address .....
City ..... Zone ..... State .....

Now you can make WELDED TUBES

faster, better, at lower cost, from—

STEEL

STAINLESS

BRASS

COPPER ALLOY

ALUMINUM

MAGNESIUM

NICKEL

INCONEL

MONEL

Within the last few years rapid strides have been made by Yoder in widening the scope and raising the speed of cold process electric-weld pipe and tube making. In tube mills perfected by Yoder many non-ferrous metals can be induction-welded in gauges up to .154" and at speeds approaching those attained in resistance welding steel tubes.

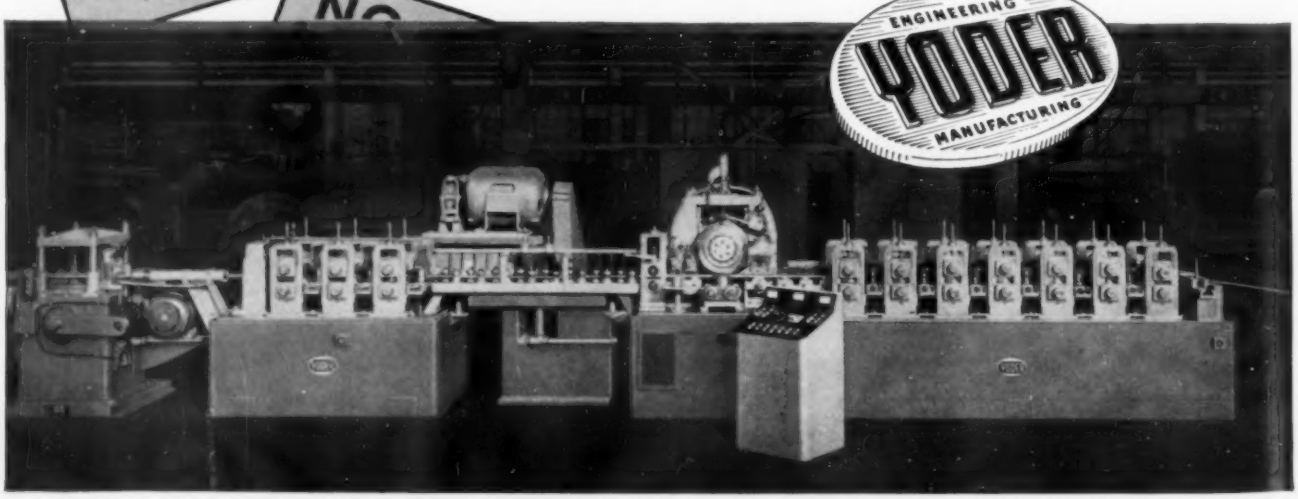
Further, speeds up to 250 fpm are reached in induction-welding steel tubing in the same gauges.

New, compact Yoder "4-in-1" Welding Transformer is the last word in resistance-welding steel pipe and tubing in sizes up to 24" diameter.

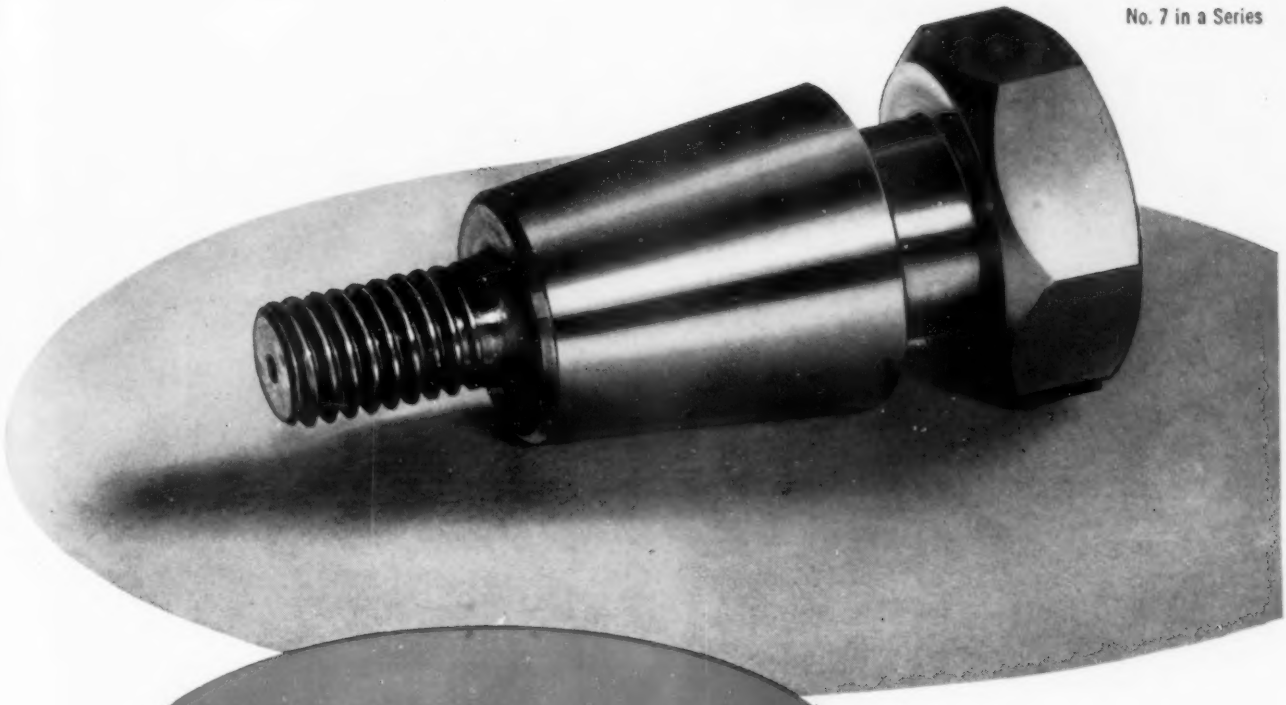
More specific information, literature and estimates on request, without obligation on your part.

THE YODER COMPANY

5525 Walworth Ave. • Cleveland 2, Ohio



No. 7 in a Series



carbide service available

data for comparison

Part	Petcock Center
Machine	1⅝" Six Conomatic
Tools	100% Carbide Tipped
Material	X-1112
Stock Size	1" Hexagon
R. P. M.	1562
Time	8 seconds

Where conditions are favorable, 100% carbide tool-ups on "Automatics" make HSS tools appear as obsolete as ancient tools of carbon steel.

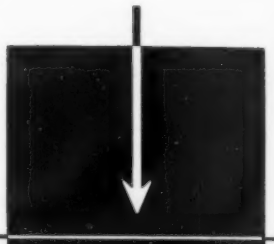
In determining the "favorable" conditions, the Conomatic Carbide Development is of real service to the "Automatic" user. Without risk of production loss or obligation of machine purchase, he gets an eye-witness demonstration of the profit possibilities of 100% carbide tooling to his own work.

Conomatic } CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

NUMBER TWO IN A SERIES

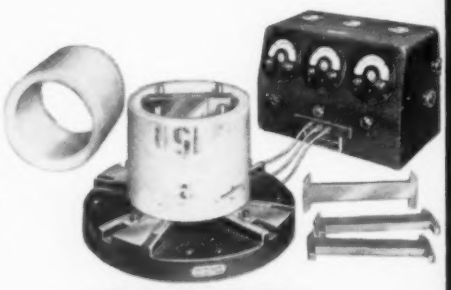
What's The Best Way To Gage These Parts ?

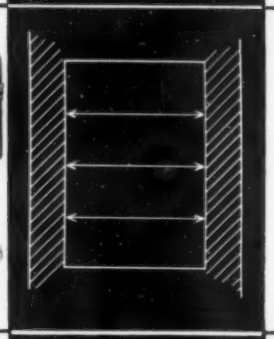
Tips from Taft-Peirce on when and where to use a T-P CompAIRator Air Gage



Three ID's
Tolerance: .120″

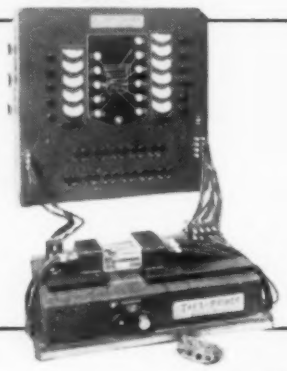
One three dial T-P CompAIRator Air Gage checks three ID's simultaneously on this asbestos cylinder. Only a T-P CompAIRator can check such wide tolerances. Versatile as well as sensitive, T-P CompAIRator equipment may be designed to check most any specific tolerance range from .0001″ to .125″. And most any dimension from simple ID's and OD's to complex tapers, barrel shapes, squareness or ovality.

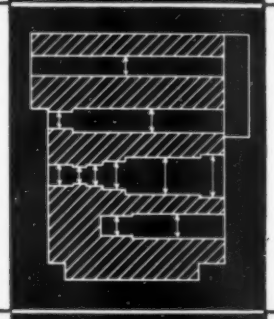




Eleven ID's
Tolerance: .001″

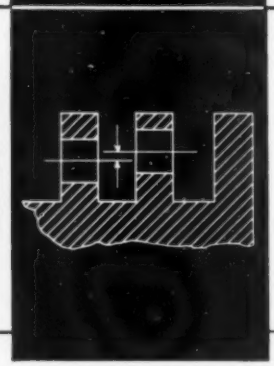
One eleven dial T-P Air Electric CompAIRator reduces inspection of 11 ID's on this valve body to a fraction of a second. Lights indicate any dimensions out of tolerance. Dials give exact readings of size. Savings in time alone paid for this unit in short order. Vibration, jarring, tilting won't disturb its accuracy.





Concentricity
Tolerance: .0002″

This T-P Computing CompAIRator indicates on one dial the total eccentricity between two diameters. Saves multiple measurements and a computation. An exclusive T-P development, Computing CompAIRators may also be used to speed and simplify such checks as center distance, taper, and squareness of bore-to-face.



For more examples and the complete story on Taft-Peirce CompAIRator Air Gages send for Bulletin.

WHAT IS A COMPAIRATOR AIR GAGE?

A CompAIRator is a sensitive gaging instrument that measures variations in the velocity of tiny jets of air. When work is placed over these jets, air flow is restricted and its velocity reduced. Any change in air velocity reflects a change in part size, which is immediately shown on a calibrated indicator. Since only air contacts the part in most cases, there is minimum wear on gaging members. Fast, accurate, dependable, a T-P CompAIRator is simple to operate, requires little or no maintenance.

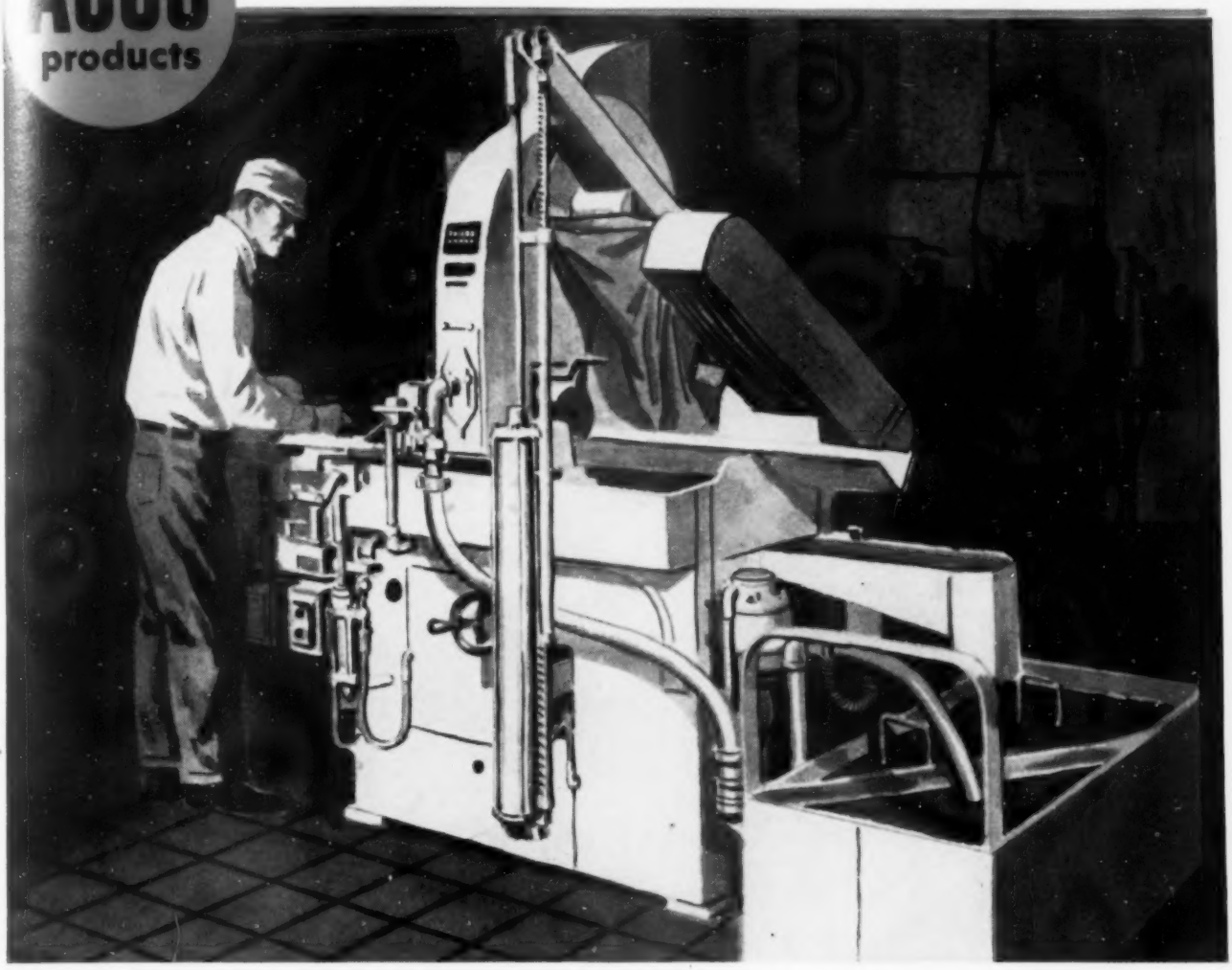
STANDARD AND SPECIAL COMPAIRATORS | COMPUTING COMPAIRATORS | AUTOMATIC SORTING MACHINE | AIR ELECTRIC COMPAIRATORS

T-P means Top Precision

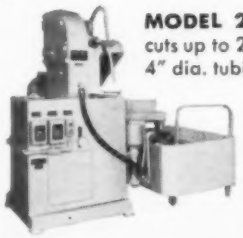
THE TAFT-PEIRCE MANUFACTURING COMPANY, WOONSOCKET, RHODE ISLAND

ACCO products

Campbell Abrasive Cutters

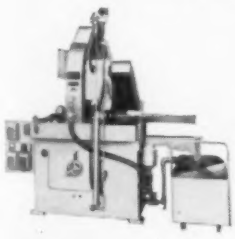


Reduce cutting time on alloy and high carbon steel from minutes to seconds...



MODEL 223
cuts up to 2" dia. solids; 4" dia. tubing

MODEL 28 SEVER-ALL
dry cutter with capacity to 4" x 4" solids



MODEL 406 CUTAMATIC
cuts up to 6" dia. solids

• CAMPBELL Abrasive Cutters reduce your labor costs and the number of machines required. They do it by cutting alloy and high carbon steel in seconds instead of minutes. They give you a clean, smooth cut without work-hardening, and often eliminate finishing operations.

A complete line of CAMPBELL Abrasive Cutters—fully and semi-automatic—are available to fit your specific cutting requirement. CAMPBELL sales engineering experts will help you select the cutter your work demands. They will consult with you on cutting problems.

Why not increase YOUR cutting output per man hour?
Write for Bulletin DH-301 on "The Principles of Abrasive Cutting"

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TRADE MARK

Campbell Machine Division
AMERICAN CHAIN & CABLE
945 Connecticut Avenue, Bridgeport 2, Connecticut

Wet and Dry Cutters and Nibblers

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• greater production
• lower costs
• smaller investment

PRECISION DESIGNED AND BUILT TO MEET THE REQUIREMENTS OF THE AGE OF AUTOMATION

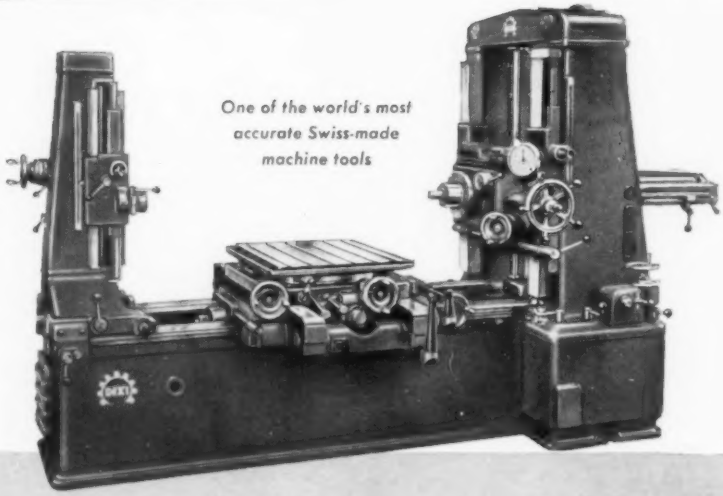
Dixi 60 Combination

Horizontal Boring Mill & Jig Borer

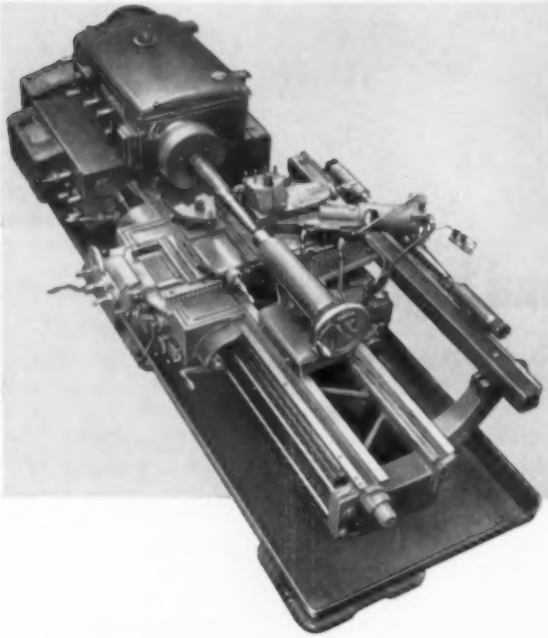
With 5 optical microscopes

A precision machine for boring, drilling, recessing, and milling work. Built-in rotary table with optical microscope can be rotated 360°. Headstock, column, and table settings by optical microscopes to insure overall accuracy of .0002". Table and spindle head have variable hydraulic feed. Mechanical spindle feed can be changed without stopping spindle and is provided with automatic depth stop.

No. 40 taper spindle. Spindle speeds 32-1350 R.P.M. Feeds .0015"—.010" per rev. Table size 28¾" x 32⅝" max. distance spindle to table 19¾". Table travel 23⅝". Spindle travel 24.4".



One of the world's most accurate Swiss-made machine tools



Heavy Duty Lathe *High Precision, Reliability, Top Performance Schaerer Model UN-450*

Twin cross slides. Copies from cylindrical or flat template either longitudinally or cross. Twin slides permit rough turning and finish turning in the same operation in many instances. Swings 17¾" over bed, 9" over carriage, 20-5/64" over gap. Center distance 60". Spindle speeds 31.5 to 1400 R.P.M.

Hydraulic copying attachment can be removed to permit use as a regular twin slide lathe when necessary. 10 H.P. motor drive to spindle. Separate motors for coolant and hydraulic pump. A production lathe built to tool room standards.

- *Guaranteed Service by Trained Staff*
- *Engineering Staff will make recommendations based on your requirements*
- *Spare parts in Stock*
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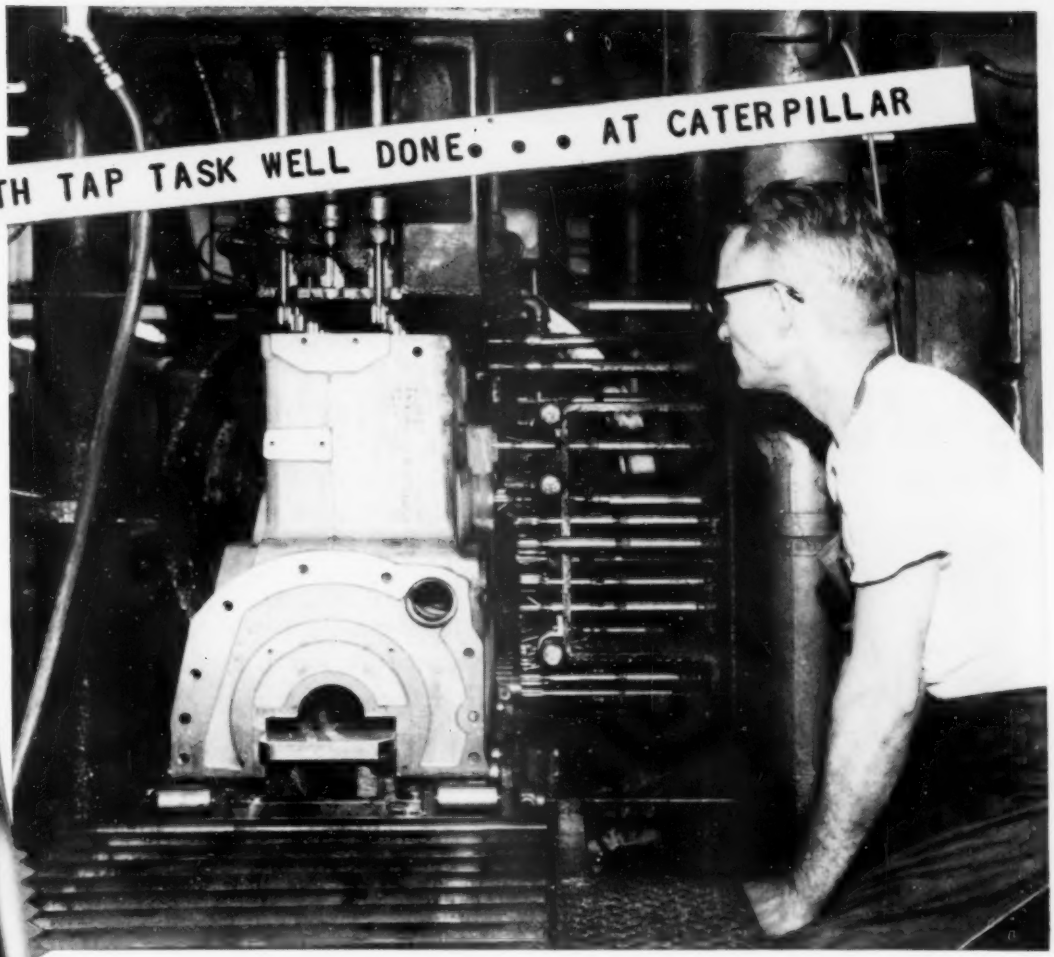
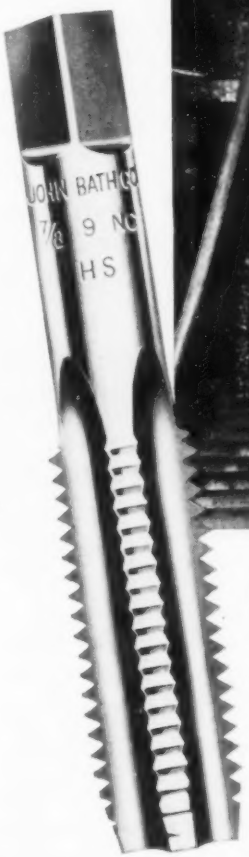




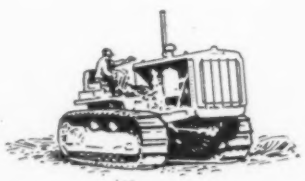
Contributing to CATERPILLAR Leadership

Here's a shop-eye view of Bath Taps at work, threading a Caterpillar* diesel engine block.

On the production line of "the World's Number One Earthmover" . . . Bath Taps help to uphold a manufacturing tradition based on getting top precision out of every plant operation.

When you see a Cat* machine on the job . . . and you see them often . . . you'll find performance proves the quality is there . . . even in small, but important tasks like tapping.

A Bath representative will be glad to tell you why industrial leaders depend on Bath regular and custom built ground thread taps for longer life, less down-time and lower production costs.



*Both Caterpillar and Cat are registered trademarks ®

Insist on BATH TAPS for BETTER THREADS

JOHN BATH & CO., Inc.

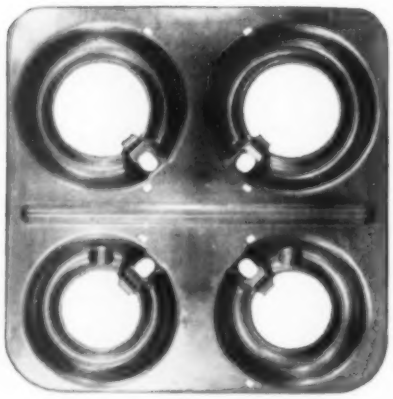
28 Grafton St., Worcester, Mass.

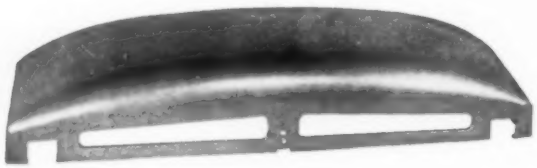
PLUG CYLINDRICAL AND THREAD GAGES • RING THREAD GAGES • GROUND THREAD TAPS • INTERNAL MICROMETERS

Plastic Low Cost Tooling

For

Dies . . . Drill, Welding, and Assembly Jigs





Vulcan, keeping pace with modern tooling, can recommend plastic tooling for medium production on numerous tool programs.

Plastic tools are light in weight, have good impact, compressive strength and dimensional stability. No hand finishing of parts required as galling or marking is eliminated by using plastic form dies.

Contours and odd shapes are cast or laminated to suit individual tools, saving expensive machine and hand finishing operations.

Plastic tools, built in a matter of days instead of weeks, lower your tool costs for those medium production runs.

Our actual production figures prove plastic has a definite place in modern production.

Vulcan Tool Company's organization, building fine tools since 1916, believes new tooling developments must be proved by tool engineers. Since plastic is not a cure-all your problem should be handled by recognized, practical tool men.

Our engineering staff will recommend the correct plastic material and advise if parts of your tooling program should be in plastic.

Send a part print and your production requirements for quotation and recommendations.

Major Vulcan Services . . . Engineering, Processing, Designing and Building . . . Special Tools . . . Dies . . . Special Machines . . . Vulcamatic Transfer Machines . . . Automation . . . including the Vulcan Hydraulics that Form, Pierce, Assemble and size. Vulcanaire Jig Grinders . . . Motorized Rotary Tables . . . Plastic Tooling.

VULCAN TOOL CO. . . . PLASTIC TOOL DIVISION

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REHNBERG-JACOBSON

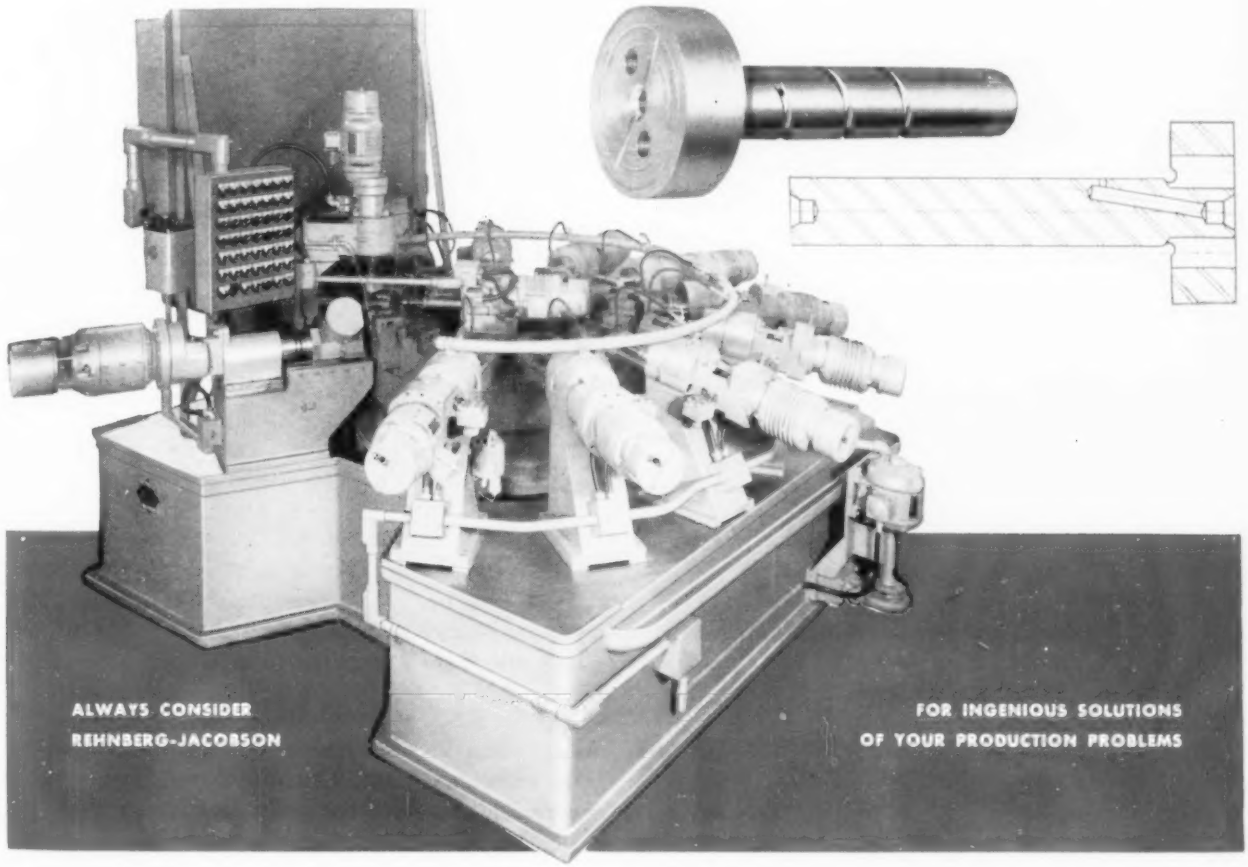
Shows the way to...

DRILL AND REAM SOME "TRICKY" HOLES IN ROTORS FOR FREEZER COMPRESSORS

This 13-station Automatic Index machine speeds up the performing of several operations that are a bit off the beaten track — and, for good measure, a slot-milling operation is thrown in. As can be seen, standard Rehnberg-Jacobson No. 2 and No. 3 Drill Units are correctly placed to handle the operations in proper sequence, including a plunge-milling head, one unit that is vertical, and another in the middle of the Index Unit to center-drill the small end. The net result is a capacity rating of 263 pieces per hour.

ONE MACHINE HANDLES TWO SIZES

The user of this machine makes *two* of these pieces, differing only in thickness of the big end and overall length. However, the adaptation of the machine to handle either one with a minimum of adjustment resulted in the introduction of several ingenious devices. The necessity for such arrangements arose from the existence of a locating step and several bottom drilling and bottom reaming requirements. However, the result is extremely successful and the changeover takes only a very short time — "a few minutes", as they say.



ALWAYS CONSIDER REHNBERG-JACOBSON FOR INGENIOUS SOLUTIONS OF YOUR PRODUCTION PROBLEMS

Designers and Builders of Special Machinery

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REHNBERG-JACOBSON MANUFACTURING COMPANY

ROCKFORD, ILLINOIS

spot the champ

. . . and with high speed steels the champion's always REX

Compare the freckles and you'll pick the champ. And it's easy to spot the champ in high speed steels, too, for Crucible REX® has been the *standard of comparison* for over half a century.

Prove the reasons for REX's superiority in your own shop. You'll like its hardenability. . . response to heat treatment . . . fine tool performance. Like thousands of other users, you'll agree *you can't find a high speed steel to outperform REX.*

Ask for REX, a *prescription-made* Crucible product, at Crucible warehouses or leading distributors from coast to coast. *Crucible Steel Company of America, Henry W. Oliver Building, Pittsburgh 30, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

ASSEMBLE THE TYPE OF GAGE YOU NEED
. . . with Rectangular or Square Gage Blocks

The DoALL Micro-Step Gaging System enables you to quickly assemble gages, accurate to millionths, for use *in the toolroom and shop* as well as in the lab or inspection department. This inexpensive system will reduce errors and rejects, and eliminate many costly special gages . . . saving time and money. . .

DoALL

The DoALL Company
Des Plaines, Illinois

turn the page for more details.

Everything for Dimensional Quality Control

DoALL MICRO-STEP GAGING SYSTEM

Here is the means for directly applying gage blocks to thousands of precision measurement jobs which previously could be checked only with less accurate gaging setups.

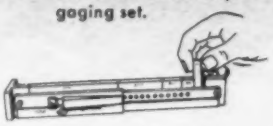
—the means for securing micro-inch accuracy on inside as well as outside measurements.

—the means for making pin gages, snap gages, indicating gages, height gages, depth gages, go and no-go gages for use in all gaging operations.

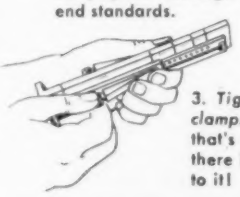
Keys to the system are the new DoALL Gage Holders and End Standards with full exposed measuring surfaces. No other gage system offers such a combination.

Ask for literature on Micro-Step, DoALL rectangular blocks and NEW SQUARE BLOCKS.

1. *Select end standards from Micro-Step gaging set.*



2. *Assemble* — place blocks into channels; snap pins through end standards.



3. *Tighten clamps*— that's all there is to it!

Internal indicating pin gage.

Go and no-go gages.

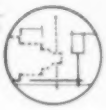
Height gage with scriber.

Indicating comparator gage.

OPTICAL INSPECTION

Bausch & Lomb Optical Comparators, sold exclusively by DoALL, permit quick visual check of parts to "tenths." Also Toolmaker's Microscope, Stereomicroscopes, Shop and Brinell Microscopes, Contour Measuring Projectors, etc. Ask for Catalog.

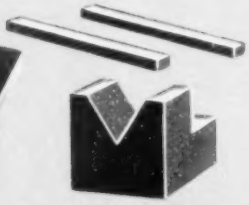
With DoALL monolights and optical flats you can "see" millionths of an inch variations in flatness, size and parallelism. Optical flats from 1" to 10".

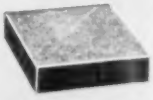


Charts and fixtures made to order for optical inspection work.

Square and round optical flats.

REFERENCE INSPECTION





Granite and steel surface plates, V-blocks, parallels, angle plates and straight edges.

Handy Working Flat 8" x 12" x 2", .0002" surface accuracy... only $22.50.

DoALL granite surface plates, parallels, flats and V-blocks are of the densest, strongest, least absorptive granite available.

Harder than tool steel; velvet smooth; easily cleaned; accuracy to plus .00005" minus .0000"! The finest available.

COMPARISON INSPECTION

Surface roughness scales, comparators, setting discs, plug and ring gages — to speed inspection and assure accuracy.

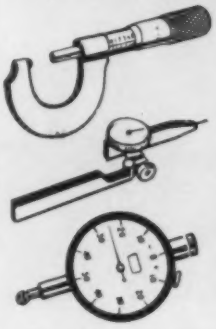
DoALL Producto-Chek Comparator with .0001", .00005" and .000010" gaging heads — low cost — extreme accuracy — direct reading — no gears, levers, racks. Ask for Catalog.

Electrical Comparator

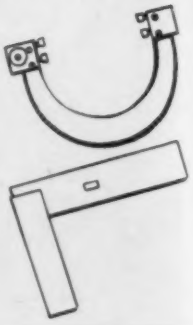
Producto-Chek

Thread and Cylindrical Plug and Ring Gages

MECHANICAL INSPECTION



Light weight hollow frame micrometers for faster work, less fatigue, better balance. Standard and special micrometers of all kinds. Snap gages, dial indicators, height and depth gages, squares, scales, calipers . . . and many more. All available at your DoALL Store.



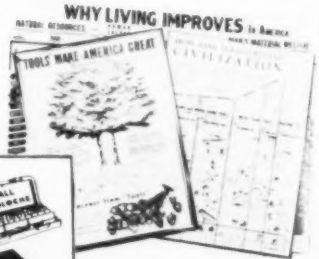
DoALL

Make DoALL your inspection equipment headquarters. Ask for literature and free demonstrations. Call your local DoALL Store . . . listed in your classified phone directory . . . or write The DoALL Company.

Friendly DoALL Stores . . . (in 40 cities)

Personalized Service . . . Complete Stocks . . . Local Delivery

Call Your DoALL Service-Store
DoALL SAW BANDS
DoALL GAGE BLOCKS
DoALL GRANITE PLATES
Machine Tools • Cutting Tools • Measuring Instruments
Shop Supplies • In Stock
The DoALL Company, Des Plaines, Ill.



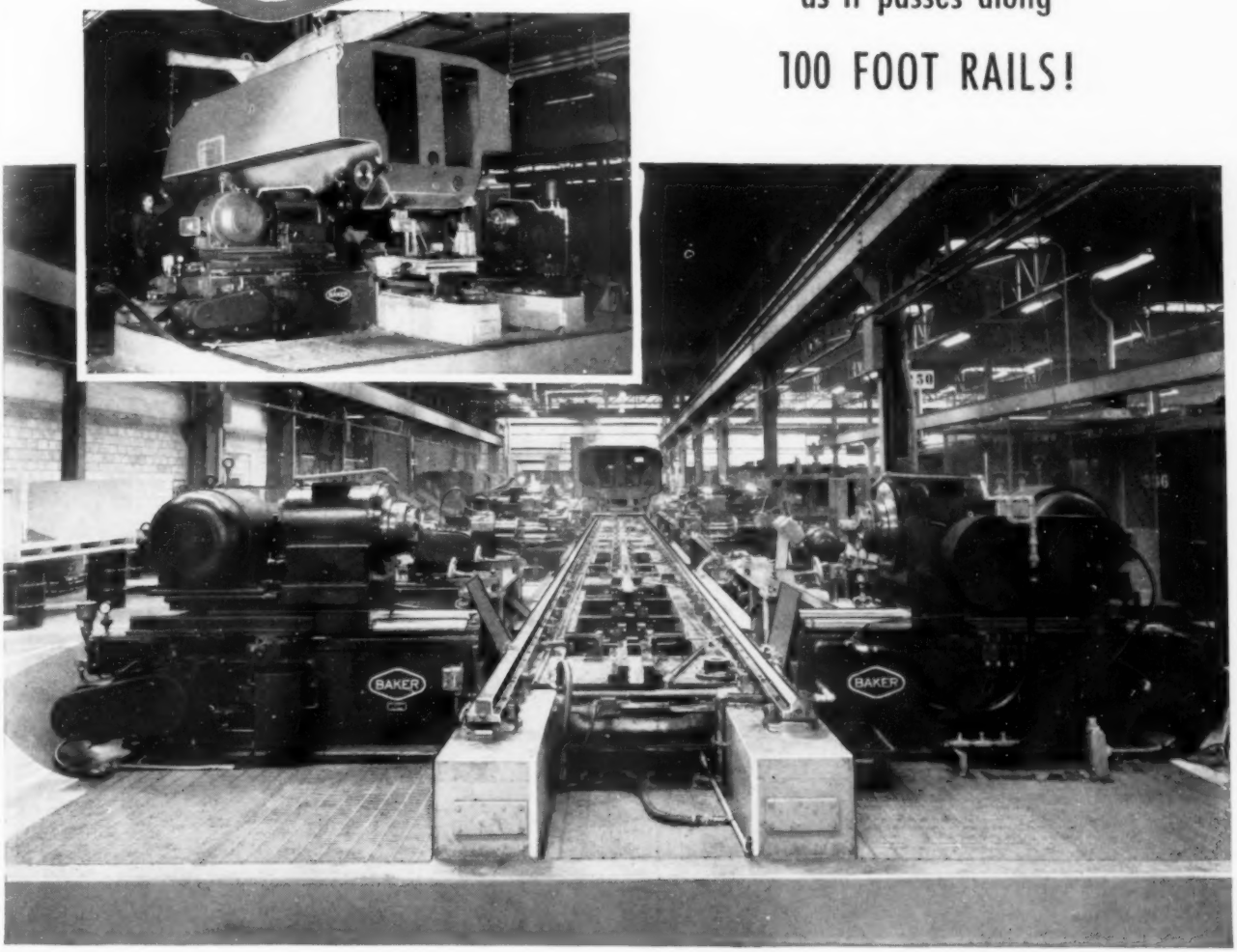
EDUCATIONAL STUDY WALL CHARTS

Economic Principles

$1.00 each postpaid

Lower quantity prices

New BAKER Automatic MACHINES 15,000 lb. TANK HULL as it passes along 100 FOOT RAILS!

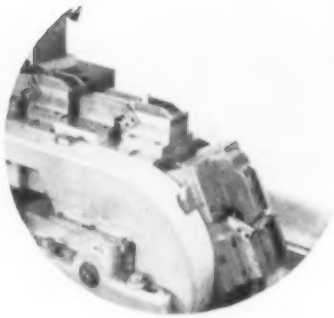


OPERATIONS: DRILLING . . . TAPPING . . . BORING . . . FACING on 102 holes . . . plus 10 main bores. Mounted on a specially-built floating concrete slab, this huge new Automatic Baker Transfer Machine accurately performs multiple drilling, tapping, boring and facing operations on 15,000 pound rough weldments 9 feet wide and 16 feet long. Savings achieved in production costs with a machine of this type are tremendous. Baker engineering know-how stands ready to solve your production problems . . . with cost cutting standard or special, single or multi-operation machines.

Write regarding your specific job problems . . .

BAKER BROTHERS, INC. Toledo, Ohio
DRILLING . . . TAPPING . . . KEYSEATING and CONTOUR GRINDING MACHINES

Lower Cost per piece with Surface Broaching of small parts



■ Holding fixtures are designed for quick, convenient loading, with automatic clamping and unclamping.

■ In many plants where large quantities of duplicate metal parts are being machined, substantial savings are being made through the adoption of surface broaching. Production is exceptionally high, close tolerances are maintained, and tool maintenance costs are much lower than with ordinary methods. Foote-Burt engineers, pioneers in this advanced machining method, have had a wide experience in applying surface broaching in many fields.

THE FOOTE-BURT COMPANY
Cleveland 8, Ohio
Detroit Office: General Motors Building

☆engineered for production

FOOTBURT

PIONEERS IN SURFACE BROACHING

THE NEW

LOW COST

SINGLE DISC JOHNSON CLUTCHES

This is "it" . . . a Single Disc clutch that stays cool on the job . . . in both horizontal and vertical installations. The answer is "Separator Springs," the same feature that has popularized our Maxitorq Clutch.

If extreme compactness is not an essential, the Johnson Single Disc Clutch will meet or beat all competition . . . for applications in the field of light machinery . . . as a better clutch at a competitive price (see typical applications at right).

Available are two capacities, No. 350 — 3 h.p. max. and No. 450 — 6 h.p. max. A simple hex key frees the knurled ring for easy manual adjustment. The "floating" disc prevents drag, abrasion, and heating in neutral. And several driving combinations may be obtained, including V-belt.

For positive control of power transmission in its field, the Single Disc Johnson is tops. Write Dept. TE-4 for complete specs.

SEND FOR BULLETIN NO. 250

APPLICATIONS

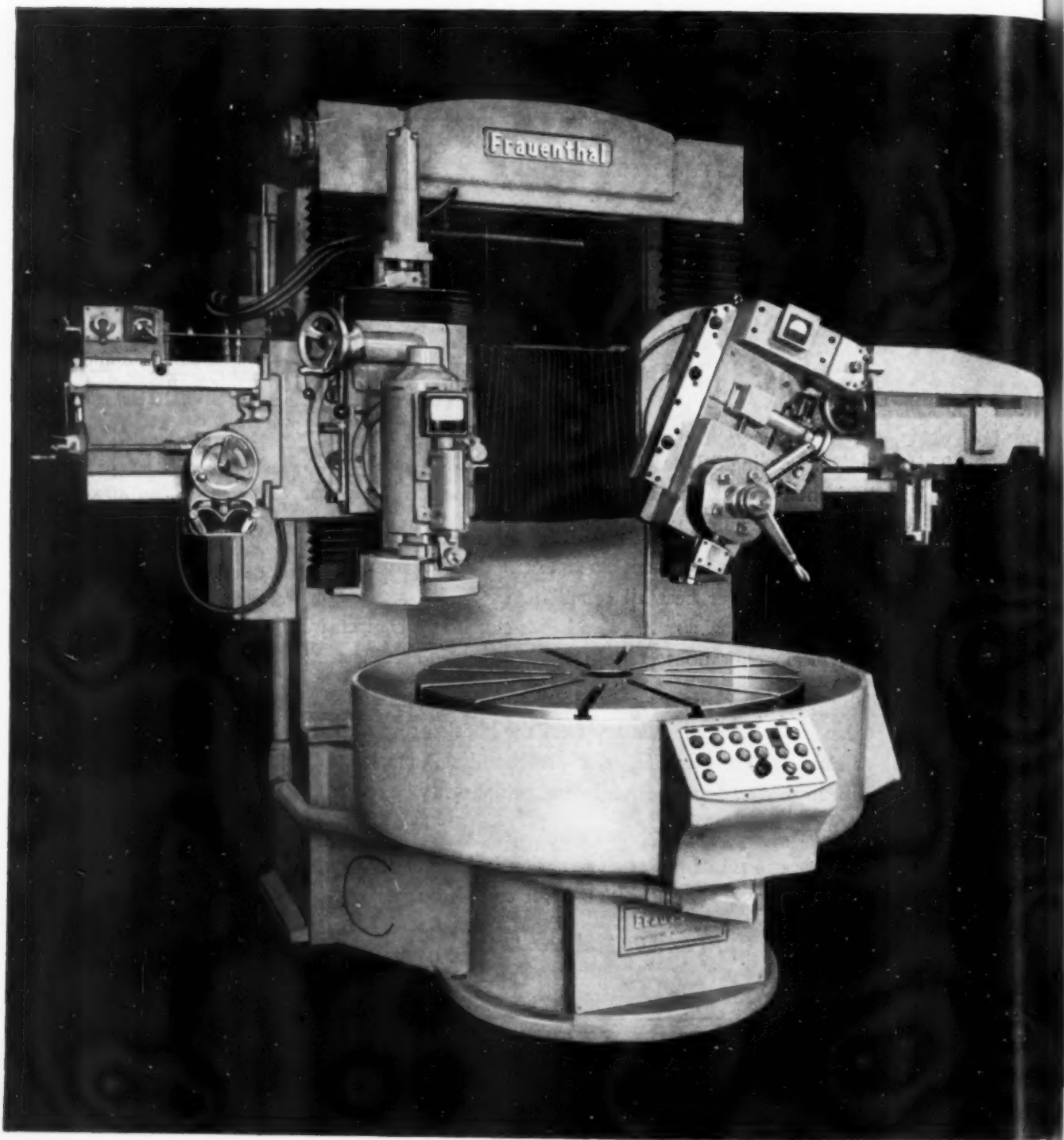
Accessory Drives, Air Compressors, Bag Making, Boat Drives, Bread Wrapping, Chain Drives, Combines (farm), Conveyors, Crop Seeders, Cultivators, Dusting Machines, Feed Grinders, Floor Scrubbing, Fruit Cleaners, Gasoline Engines, Generator Drives, Hay Balers, Hoists, Loaders, Lawn Mowers, Milk Coolers, Mixing Machines, Motor Scooters, Packaging Machines, Paper Shredders, Power Fans, Power Saws, Power Take-offs, Pumping Equipment, Sand Spreaders, Sewing Machines, Spraying Equipment, Textile Machinery, Threshers (small), Tobacco Machinery, Tool Grinders, Tractors (garden), V-Belt Drives, Vegetable Sorters.

2CJ55

THE CARLYLE JOHNSON MACHINE COMPANY
MANCHESTER • CONNECTICUT

CAN YOU

to .000200" accuracy



turn, bore and grind in a single set-up?

The Frauenthal 3100 Series offers this precision and versatility with these cost-cutting features

1. Utmost versatility — Both grinding compound and turret slide can be swiveled to meet practically any angular requirement.

2. Super-precision performance — Only a Frauenthal grinds related surfaces to accuracies within .000200", producing consistently uniform precision in concentricity, parallelism and roundness.

3. Horizontal table — Loads easier and faster than vertical face plates. Horizontal table also provides greater stability for large, heavy parts.

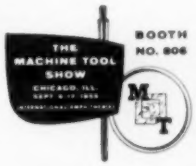
4. Simplified tooling — Horizontal table permits simpler fixtures, particularly for thin-section jet engine parts, plus economy of dual purpose tooling for turning and grinding.

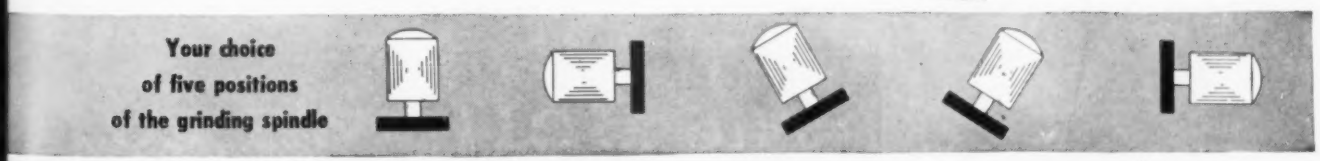
5. Convenient controls — All operating controls are easily within the operator's reach for quick selection of feeds and speeds. Electrical interlocks are provided for utmost safety.

6. Contour turning — Hydraulic duplicator attachment (turning head) performs tracer controlled turning operations most accurately and performs repetitive operations at lower cost.

May we help you?

If you'd like further information on how the 3100 Series precision turning and grinding machine can give you production and/or tool room advantages — our engineers are at your service. Write for informative bulletin No. 301.





Frauenthal Division · KAYDON ENGINEERING CORP. · Muskegon, Michigan

Bellows BEM5 Air Motor

WHY YOU SHOULD BUY the AIR CYLINDER with the Built-in Valve

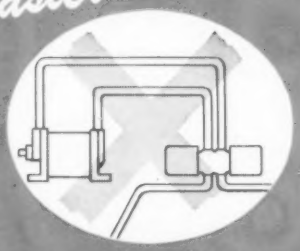
When it comes to down-right value, the Bellows Air Motor (the air cylinder with the built-in valve) tops them all for both standard air cylinder operations or as a component in new design applications. Not only are you buying a precision-built power unit — but you are buying a complete power unit. No extra valves to buy —dual speed control valves as well as directional valve are integral with the cylinder; no cumbersome, complex piping to install—a single, flexible air hose is all the hook-up you'll need.

You can have your choice of built-in directional valves: 110 volt or 8 volt electrical control, standard or explosion-proof, manual control, or air poppet valve control. Five bore sizes: 1¼", 1¾", 2½", 3⅝", and 4½". Any stroke length.

WRITE FOR THESE TWO BULLETINS:

Contain full data and specifications on Bellows Air Motors. Free. Address Dept. TE455
The Bellows Co. Akron 9, Ohio. In Canada: Bellows Pneumatic Devices of Canada, Ltd. Toronto.

IT IS
Easier to Install



IT TAKES
Less Space

ITS ACTION
Is Faster

IT IS
Easier to Control

1108-A

The Bellows Co.
AKRON, OHIO

Tool Steel Topics

BETHLEHEM STEEL

...ic Coast Bethlehem products are sold ...m Pacific Coast Steel Corporation

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

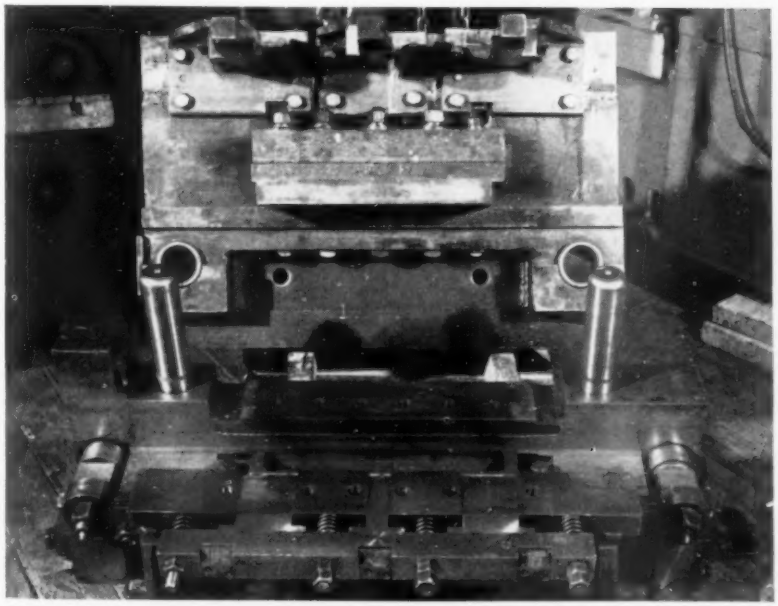
Export Distributor: Bethlehem Steel Export Corporation

600 Stovepipe Shields Turned Out per Hour with BTR Hollow-Bar Die

In a blanking and forming operation, the Par Machine & Engineering Co., Brooklyn, uses this 58-ton press to make stovepipe shields from chrome-plated 0.015-in. steel. The die, made from five separate pieces of BTR (Bethlehem Tool Room) Hollow-Bar, is hardened to Rockwell C 60-61. It is interchangeable so that four inside diameters can be blanked and formed, and turns out as many as 600 pieces per hour.

BTR Hollow-Bar is made from our oil-hardening tool steel by a process called high-speed trepanning. With this method, hammer-forged round bars are cored out in the center, and are then rough-turned on the outside.

BTR Hollow-Bar makes it unnecessary for you to lose valuable time waiting for forged rings or discs. And there's no drilling, rough-boring, rough-facing or rough-turning required! For full information about BTR Hollow-Bar, just get in touch with your tool-steel distributor.



67 CHISEL DIE MAKES 14,000 CUTS BETWEEN GRINDS

Here's a die that's giving a good account of itself producing ends for expanded steel joists. Made of Bethlehem 67 Chisel, it blanks approximately 14,000 I-beam sections, varying in thickness from 3/16 in. to 3/8 in., before redressing is required. 67 Chisel, our chrome-tungsten shock-resisting steel, has good wear-resistance. Moreover, it is an easy steel to machine and heat-treat.

BETHLEHEM TOOL STEEL ENGINEER SAYS:

How to "Blue" Hot-Work Tools

Regardless of the lubricant used in hot-work tools, operators of such tools are continually searching for improvement. For "pickup" of metal on the tools, though a serious problem, can be minimized by good lubrication.

"Bluing" hot-work tool surfaces is a procedure which will aid the normal lubricating procedure on virtually every type of hot-work tool. As most tools of this type are ordinarily double-tempered, "bluing" can be accomplished with no expense or delay by following this heat-treatment procedure:

1. Quench tools in customary manner.
2. Temper tools as usual, to desired hardness.
3. Grind to finished dimensions.
4. Retemper at 1000 F, or higher. Temperature should be 50 F lower than the first temper. Thus the second temper serves as the "bluing" operation.
5. Tool can be placed in service without further operations on its dark, discolored surface.

Here's something else to keep in mind: when hot-work tools are redressed, it is also wise to retemper them not only for stress-relief, but also to obtain the "bluing."

SAVE MACHINING COSTS —WITH NEW DISSTON HOT ROLLED STAINLESS STEEL SHAPES

Here's big news to *Stainless* users—especially those in the jet engine and automotive fields. From Disston—leaders for 100 years in the rolling of special shapes—comes a new specialized skill to help you solve rising costs of metal shaping. After years of experimentation and over a year of volume deliveries, Disston is ready to supply complex *stainless* steel shapes to *your* specifications.

Why not discuss your problem with Disston. Find out just how much you can save with this modern production technique. Write or call: Henry Disston and Sons, Inc., Steel Sales Division, 492 Tacony, Philadelphia 35, Pa., U.S.A. Disston makes stainless, carbon, alloy and tool steel in either standard or special shapes.

DISSTON
HAS THE EDGE®

in special purpose steels and special steel shapes.

big, new catalog

75th ANNIVERSARY EDITION

Presenting the world's most complete line of mechanics' hand measuring tools and precision instruments, dial indicators, steel tapes, hacksaws, band saws, band knives and precision ground die and flat stock. Completely revised and brought up to date to commemorate Starrett's Diamond Jubilee of Precision Toolmaking — including 85 new tools added since the previous edition.

Starrett®

SINCE 1880...WORLD'S GREATEST TOOLMAKERS

get your FREE copy

Ask your Industrial Distributor or send the coupon for your *free* copy.

THE L. S. STARRETT COMPANY
Dept. E, Athol, Mass., U. S. A.

Please send my free copy of the big, new Starrett *75th Anniversary* Catalog.

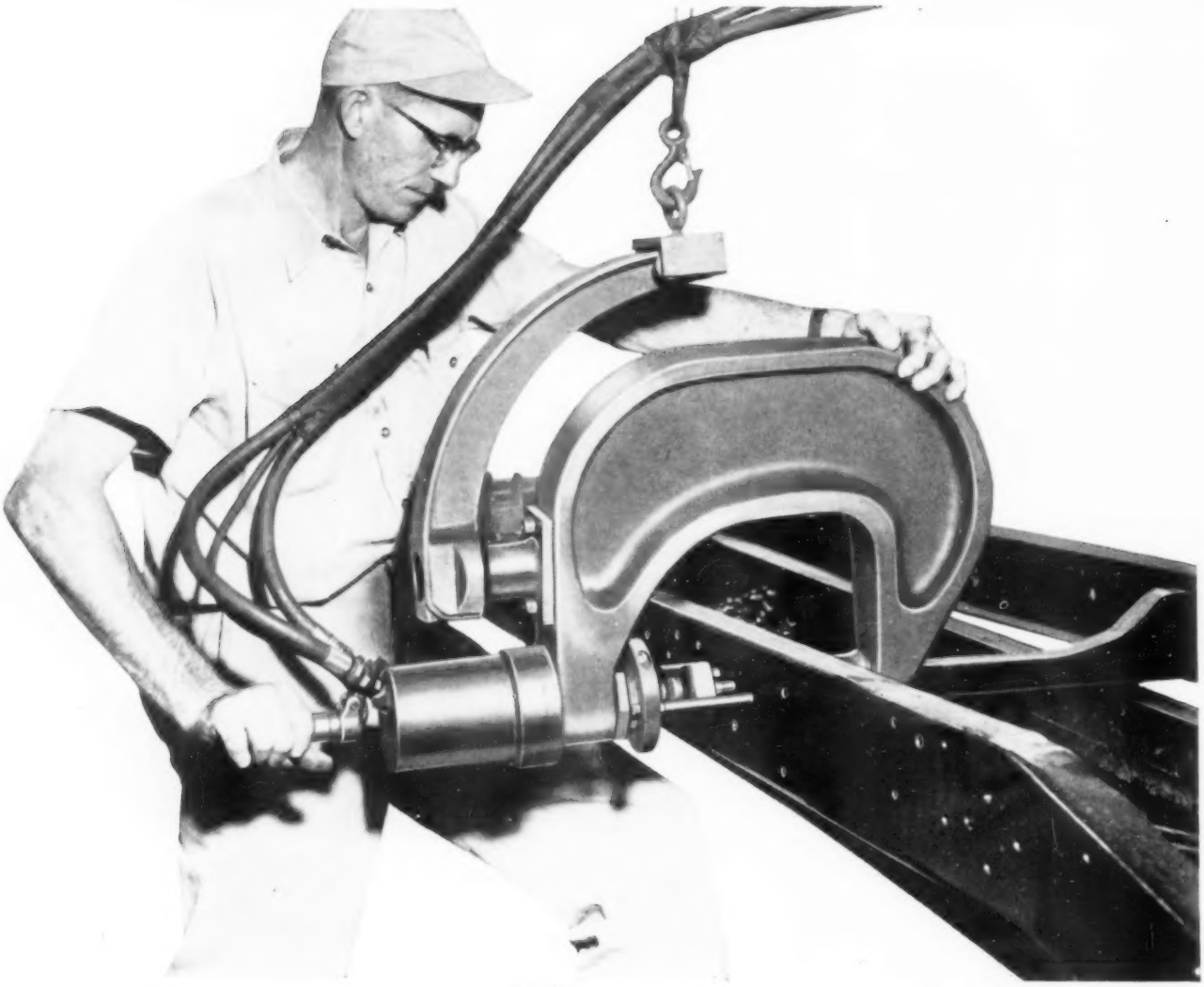
Name.....*Position*.....

Company.....

Address.....

City.....*Zone*.....*State*.....

VISIT THE STARRETT EXHIBIT, BOOTH NO. 60, QUALITY CONTROL CONVENTION, NEW YORK, MAY 23-25



delivers a

Sunday punch

every 3 seconds

Operators don't have to be "muscle men" to handle a CP 25-ton Hydraulic Punch. See how just a flick of a finger punches a 15/32" hole through this heavy steel truck frame. Light weight in proportion to its tremendous punching capacity, the CP Hydraulic Punch can be operated by one man for an entire shift. Its speed and accuracy increase holes per man hour . . . afford cleaner, completely uniform holes. Punch and die maintenance and sharpening costs are considerably lower per hole than in mechanical punch or twist drill methods. And CP Hydraulic Punches are ideal when teamed up with CP Portable and Stationary Cold Riveters.

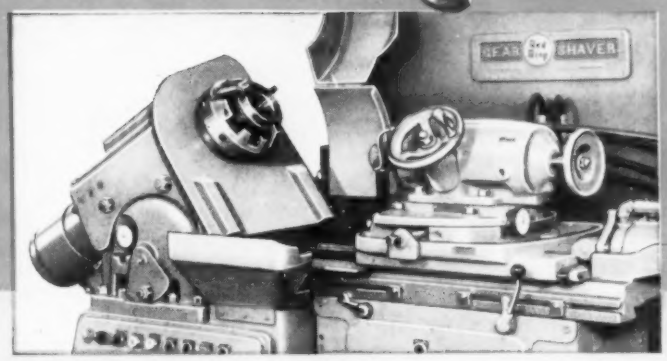
Write *Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, New York.*

Chicago Pneumatic

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

New Machine *Shaves* INTERNAL GEARS *Faster* and to *Closer* TOLERANCES

This new Red Ring Model "GCR" is a high production, high precision shaving machine for a broad range of internal gears. It provides two methods of shaving and many advantages which heretofore were available only on external gear shaving machines.



THE MACHINE TOOL SHOW
CHICAGO, ILL.
SEPT. 6-17, 1955
INTERNATIONAL AMPHITHEATRE

BOOTH 1215

- It will precision shave all spur or helical internals 3" to 12" PD, up to 4 diametral pitch with face widths to 2½".
- It will operate on an automatic and selective feed cycle.
- It provides the opportunity to use a new, rapid PLUNGE-CUT shaving cycle in addition to conventional shaving.
- Crowning by the Plunge-cut method is optional.
- It will taper-shave gear teeth.
- It assures precision comparable to that established by Red Ring Machines for external gears.
- It reduces loading and unloading time to a minimum.
- It handles gears having integral shafts.

When using the automatic feed cycle a selected number of cutting strokes, each with its own selected increment of up-feed, can be combined with whatever idling strokes are desired. At the end of the cycle the machine automatically stops in the proper backlash position for rapid unloading.

If your manufacturing program includes internal gears, write for complete information on this new shaving machine.

NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

7112

a practical approach to pressroom modernization

Announcing

TWO NEW Verson PLANS

to solve press obsolescence problems

The extensive capital expenditures required to meet competitive pressures have put many manufacturers in an unfortunate position. Modernization is necessary if the manufacturer is to price his product competitively and still make a fair profit. However, the fair profit is necessary before he can afford the modernization. Two new Verson plans make it possible to modernize now and pay for it out of the increased profits it provides. If you are one of the manufacturers faced with the dilemma of needing modernization for better profits, but needing better profits before you can afford modernization, one of these plans may be the answer to your problems.

Customized

INSTALLMENT PROGRAM

For the manufacturer who wishes to own his own presses but minimize his initial capital outlay, Verson offers a Customized Installment Program. It is called "Customized" because the payment plan is tailored to the buyer's own financial requirements rather than to a single fixed plan. Initial payments may be as low as 10 per cent of the purchase price with the balance payable over periods ranging from six months to five years. Further information on a plan to meet your needs will be furnished on request. Please outline your requirements.

Customized

LEASING PROGRAM

For the manufacturer who wants the advantages of modern, efficient presses without capital investment, Verson offers a Customized Leasing Program. Like the Installment Program, a choice of plans is available to best suit the buyer's requirements. In addition to the basic plans, options for continuation, termination and eventual purchase are also available. Special arrangements for special machines will be considered. Further information on a leasing plan to suit your needs will be furnished on request. Please outline your requirements.

A Verson Press for every job from 60 tons up.

Verson

ORIGINATORS AND PIONEERS OF ALLSTEEL STAMPING PRESS CONSTRUCTION

VERSON ALLSTEEL PRESS CO.

9336 S. KENWOOD AVENUE, CHICAGO 19, ILLINOIS • SO. LAMAR AT LEDBETTER DRIVE, DALLAS, TEXAS

MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES • TRANSMAT PRESSES • TOOLING • DIE CUSHIONS • VERSON-WHEELON HYDRAULIC PRESSES

Sensational Advance in Screw Machine Tools!

- Give more powerful, more uniform grip
- Maintain uniformly high concentricity
- Cut collet inventories as much as 65%

Each collet covers a .050" range.

Now, revolutionary Rubber-Flex design brings to users of Brown & Sharpe No. 0 and No. 0G Automatic Screw Machines and the No. 0 Hand Screw Machine a collet with a far more powerful, more uniform grip than conventional spring-type collets! What's more, these new collets cut inventories to the bone. Each collet has a nominal range of .050". A set of only 13 will cover the spindle capacity of any of the above machines from .100" to .750"!

In a Rubber-Flex Collet, steel inserts permanently bonded to rubber, hold the stock firmly . . . automatically "tighten" their grip as the power of a cut increases. The inserts have uniform hardness . . . give long wear under rugged conditions. In operation, the unusually high concentricity of a Rubber-Flex Collet assures top accuracy on the finest work. And collet faces seal flush against the chuck nut . . . protect the spindle unit from chip-laden coolant.

Get the outstanding benefits of Rubber-Flex Collets on all your round stock jobs — and on second operation work where the piece utilizes the full bearing surface of the collet. Available singly or in sets. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

Rubber-Flex* Collets for Brown & Sharpe Screw Machines

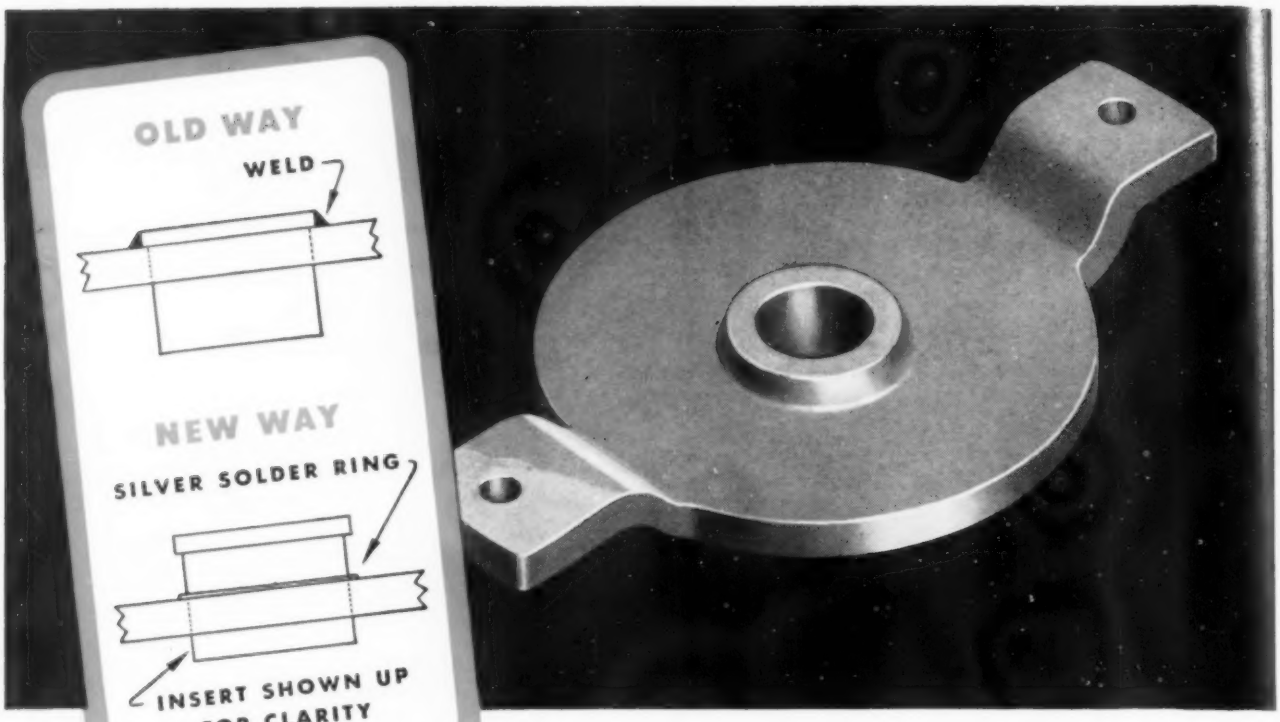
Complete sets available in convenient, sturdy boxes.

*Rubber-Flex is a trade-mark of the Jacobs Manufacturing Company who makes these collets for us.

BUY THROUGH YOUR LOCAL DISTRIBUTOR

B·S **Brown & Sharpe**

FOR FURTHER INFORMATION, USE READER SERVICE CARD: INDICATE A-4-69



Assembly Cost Cut 32% with TOCCO* Induction Brazing

Now's the time to balance YOUR production budget

This assembly may bear no resemblance to your product, but its case is typical of the savings accomplished by Induction Heating of metal parts of all sizes and shapes.

Formerly the Norris Thermador Corporation used arc welding to join the bushing and clamp shown above. In an effort to reduce costs TOCCO Induction Heating was brought into the production picture with the following results:

OLD METHOD (Arc Welding)		**NEW METHOD** (TOCCO Induction Brazing)	
Material (rod)	$ 4.56 per M parts	Material (solder and flux)	$13.83 per M parts
Labor	20.63 per M parts	Labor	8.82 per M parts
Overhead	21.25 per M parts	Overhead	9.08 per M parts
Total Cost Old Method	$46.44 per M parts	Total Cost TOCCO Method	$31.73 per M parts

TOCCO Engineers are glad to survey your operations for similar cost-cutting results — no obligation, of course.

THE OHIO CRANKSHAFT COMPANY

TOCCO

*Trade Mark Reg. U. S. Pat. Off.

Mail Coupon Today

NEW FREE BULLETIN

THE OHIO CRANKSHAFT CO.
Dept. G-4 Cleveland 1, Ohio

Please send copy of "Typical Results of TOCCO Induction Brazing and Soldering."

Name_____

Position_____

Company_____

Address_____

City_____ Zone____ State_____

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The Tool Engineer

Passing the Baton

With the publication of this message, I have completed my final act as your President. It's been a wonderful year, and I will carry many cherished memories with me for the rest of my life. The honor and dignity that you members bestow on your President is a thrill I will long remember.

The respect that our Society has among contemporary technical societies makes all the work and effort experienced by your officers seem a joy. The growing prestige of the tool engineering profession is rewarding to all of us.

I was indeed fortunate in having such a capable group of officers to work with. Their efforts made my job easier. The excellent work of each National Committeeman, and each Committee Chairman, calls for congratulations from all of us for a job well done. The Annual Committee Reports plainly show the success that they have had this year. My gratitude also goes to the employers of our members for their continued support of our Society.

Our Board of Directors also deserves commendation. Their continued wise guidance to our Society allows us to look to the future with confidence.

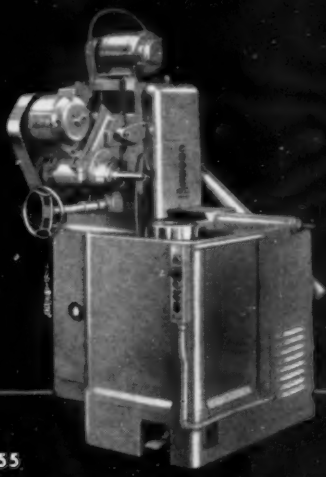
And now, I congratulate our new President and Officers, knowing full well that next year will be bigger and better than ever. Under their leadership we can't help but continue to grow in stature, prestige and technical know-how.

Joseph P. Crosby

IMMEDIATE PAST PRESIDENT
1954-1955

for rounding • chamfering • pointing • burring

Greater Flexibility with Cross Gear Machines

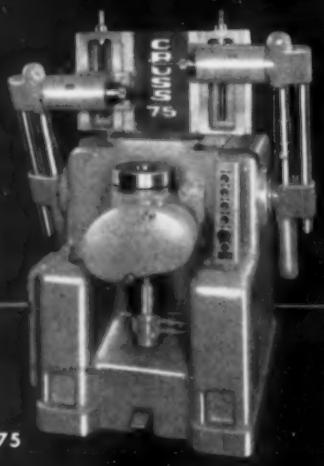


NO. 55

For rounding, pointing, chamfering or burring external and internal—
spur gears • helical gears
clutches • splines
Typical production—rounding or pointing 8 pitch 30 tooth gears—55 net hourly.

NO. 65

For pointing or chamfering external and internal—
clutches • spur gears
bevel gears • splines
Typical production—pointing 10 pitch 30 tooth gears—100 net hourly.



NO. 75

For burring or chamfering both ends at the same time—
helical gears • spiral bevel pinions
hypoid pinions
Typical production—chamfering 8 pitch 40 tooth gears—200 net hourly.

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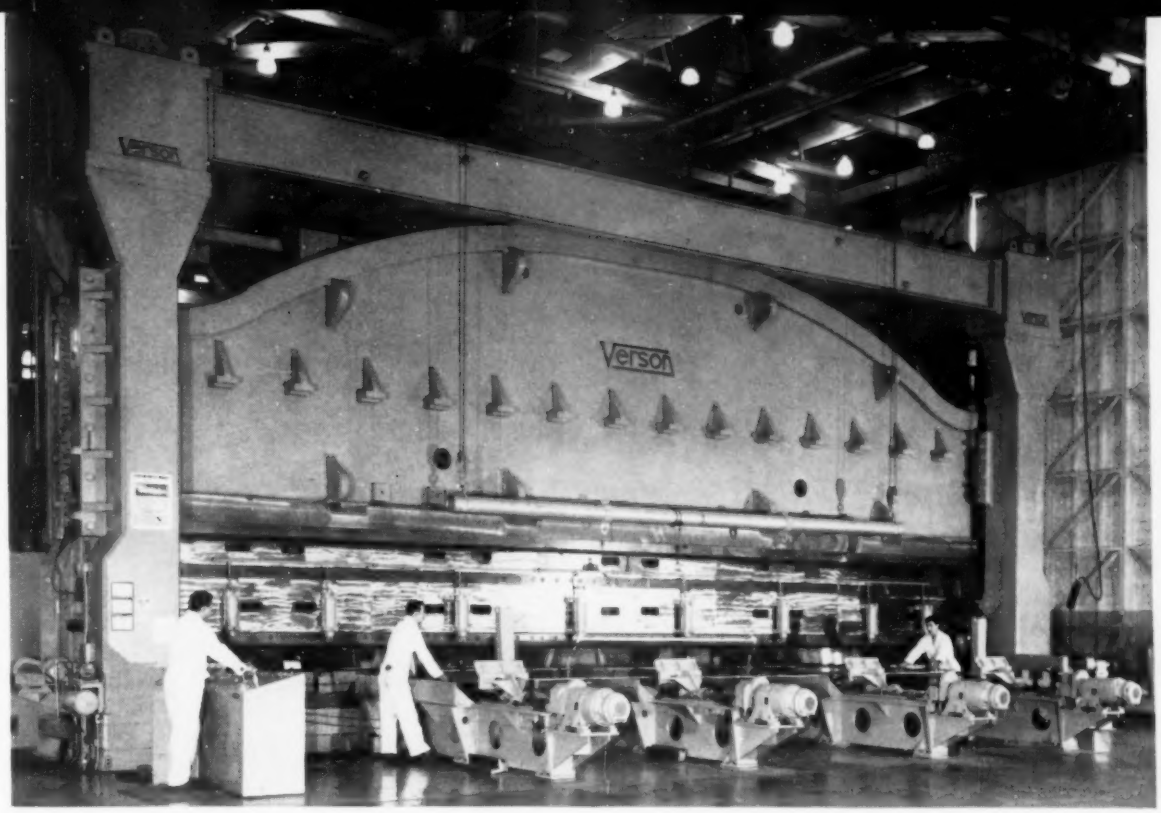

Fig. 1. Aluminum plate workpiece positioned on feed tables of press brake ready to be contoured. Control pulpit is at left.

press brake contours aluminum plate

By R. J. Delaney
General Foreman, Sheet Metal Dept.
Douglas Aircraft Co., Inc.
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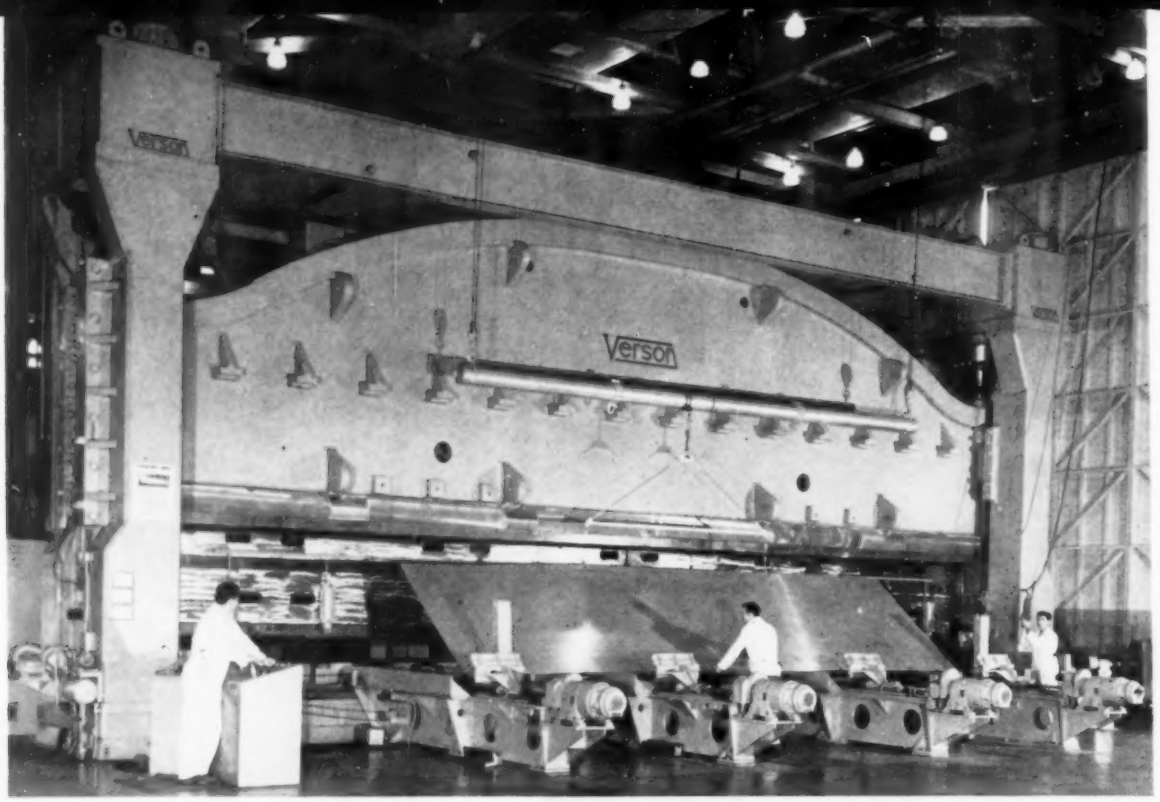
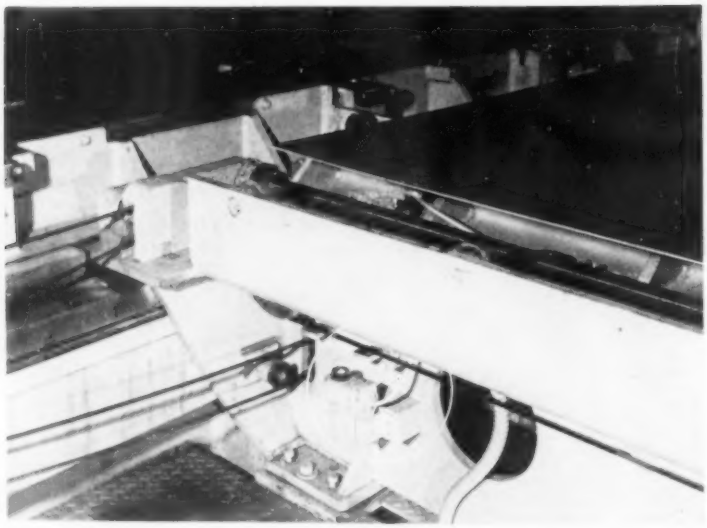
INTEGRALLY STIFFENED PARTS, developed to meet the needs of high-speed aircraft, have grown in size beyond capacities of previously existing machine tools, presses and processing equipment. While working with machine tool builders in creating machines of sufficient size, Douglas has been especially cost conscious. Without careful planning, size alone can be disastrously expensive. The plan required to care for present and future requirements calls for equipment to process parts in 10 x 40 ft modules or smaller increments.

In this way equipment, as well as the entire process line, could be set up on a coordinated basis. With the plan, equipment specifications, wherever possible, call for multiple units to accommodate workpieces in maximum sizes of 10 x 20 ft. This equipment is usually for secondary processes where the smaller units can be combined to take workpieces of the 10 x 40 size.

To complement other giant metalworking and processing equipment, a means of forming integrally stiffened plate was desired. Rolls have performed this function satisfactorily in the past but the com-





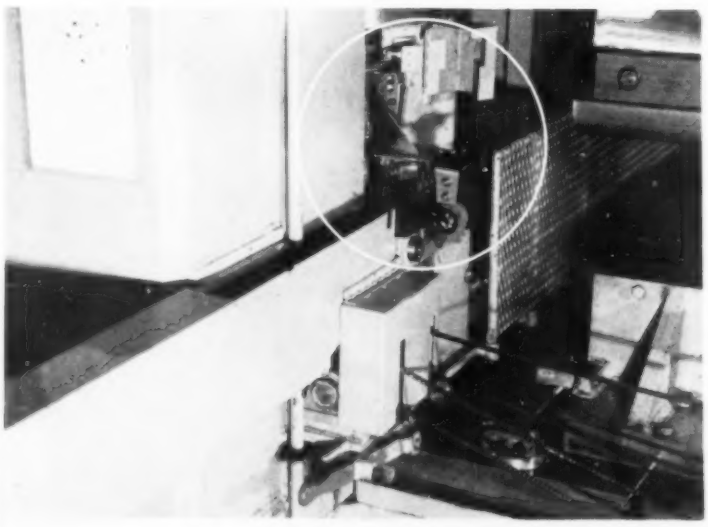


Fig. 2. (top) Large plate for press brake contouring is loaded on feed table by overhead crane.

Fig. 3. (center) Special alloy tape passes over photoelectric tube (circle area) to control advancement of workpiece under the ram.

Fig. 4. (bottom) Template riding on a rail interrupts the photoelectric tube (circle area) to initiate movement of the ram.

pany found after a survey, that for these particular specifications, press brake forming would be preferable.

The completed press brake, *Fig.* 1, built by Verson, is similar in appearance to smaller press brakes in common use in sheet metal plants throughout the country. Length of the press brake is 55 ft; height is 25 ft, and its bed is 8 ft wide. It has a capacity of 1800 tons and can make a 90-deg bend in one inch thick aluminum 20 ft long. It is used to contour and taper stiffened plate by bending in small increments and can be operated automatically or by manual controls, as desired.

In operation, plate to be formed is loaded on the feed table by overhead cranes, *Fig.* 2. There are four sections to this table; the two inside sections are used in unison to feed shorter plates under the ram. The two outside sections handle the larger plates. When either pair is inoperative it remains retracted.

A special notched steel band or tape of Elgiloy, an alloy inert to temperature changes, is an important element of the automatic feed controls. In passing across a photoelectric tube, *Fig.* 3, it energizes the motor controlling the feed of the table

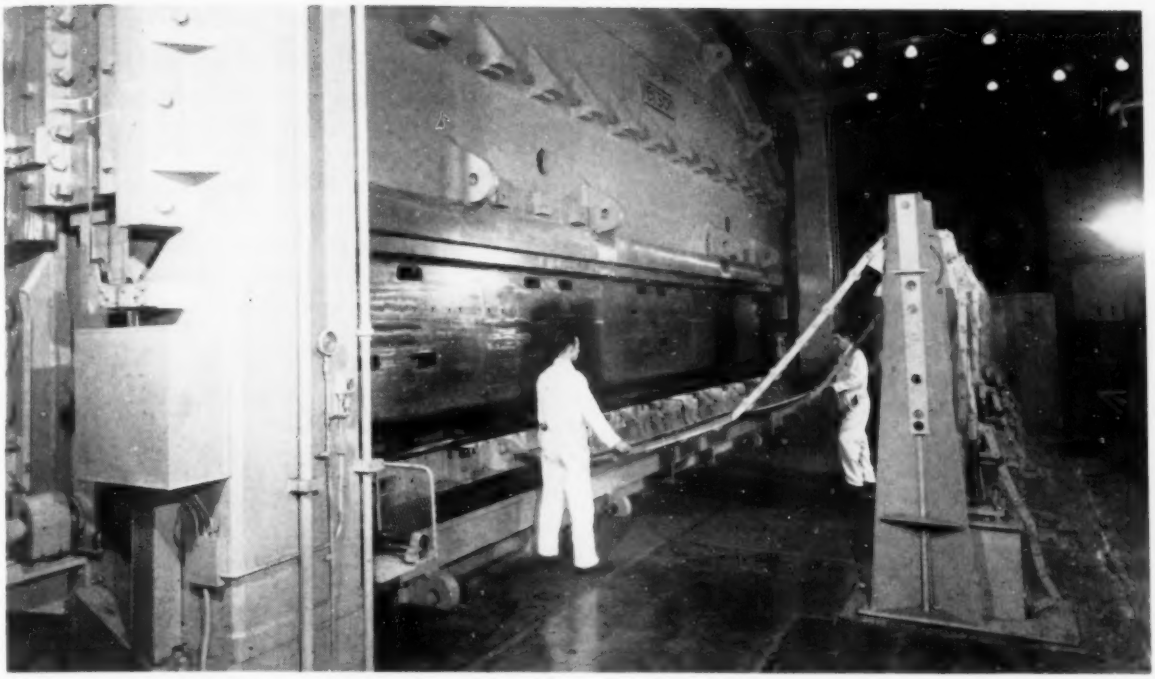


Fig. 5. Formed workpiece is held at back of brake on link chains with plastic rollers which prevent scarring.

sections, causing the workpiece to be advanced a predetermined increment in preparation for the next stroke of the ram.

The ram has equally spaced pneumatic hold-down jacks with rollers on the bottom to contact and secure the plate while the hit is made. The brake is automatically leveled by gages on each side of the press which adjust ram stops for the proper feed stroke. The ram is lowered hydraulically to perform the bending stroke. These interrelated steps of the press operation are controlled by templates and photoelectric tubes, *Fig.* 4.

With complete coordination between the movement of the photoelectric controlled feed table sections and the hydraulically operated ram, progressive hits are made on the plate in increments as small as one inch. The shape of the segmented ram die is designed to blend the contour by progressive hits so that the completed contour is a perfect arc. To contour a taper into a part the controls of the feed table sections are operated individually so that one end of a long plate is retarded while the other end is advanced.

Since the workpieces are large plates up to one inch thick, they are of sufficient weight that, if left unsupported on the back of the brake during forming, there would be a considerable spring-back effect from the part weight. To preclude this a series of laminated phenolic covered roller chains receives the plate as it is formed, *Fig.* 5. The chains automatically adjust to nest the formed portion of the workpiece in an approximately duplicate contour during operation. When completed, the large workpieces are unloaded by overhead cranes to special mobile fixtures for handling preparatory to subsequent operations.

Despite its size the press brake is a precision machine under positive control. Settings for the ram can be predetermined to within several thousandths, while repetitive accuracy of the actual stroke is to a few ten thousandths of an inch. In addition to conventional press brake work and contour forming, the press brake can also be used for stretch forming by the use of special fixtures. Small radii such as would be required for the leading edge of a high-speed airfoil, can be formed in large plate sections.

Other units in the line for processing integrally stiffened components include: a skin and spar mill with a bed to accommodate 10 x 40 plate, heat treat equipment to handle the same size modules and an anodizing installation. The mill is primarily for pilot runs.

The heat treat and quench installation is built of two independently operating 20-ft sections which will handle 90 percent of present production. When larger size parts must be handled, the two sections are joined. The same tandem arrangement is used for the anodic treatment installation. In this way maximum use is secured from this equipment at lowest operating cost. Though the massive equipment line has been in operation a relatively short time, production runs are building a backlog of tooling and manufacturing technique that promise to keep well ahead of requirements for some time to come.

Gadgets

Ingenious Devices And Ideas To Help The Tool Engineer In His Daily Work

Accurate Bushing Installation

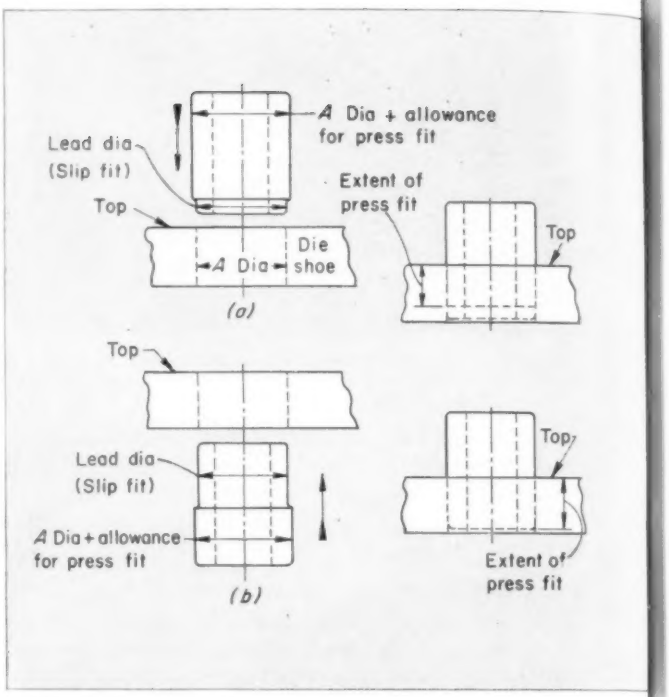
Pressing bushings into die shoes or other plates and maintaining a high degree of squareness presents a problem for many small shops.

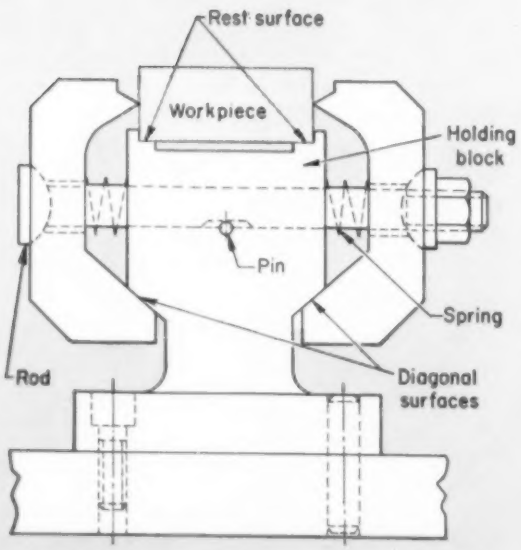
The usual method of doing this is to provide a short lead on the bushing as shown in view (*a*) of the accompanying drawing. After the bushing is started into the hole it is pressed home as indicated by the arrow. Using this approach, the bushing can easily be started in a cocked position, and great care must be used to press it squarely in place without shearing one side of the hole.

A good solution to this problem is to provide a long lead on the bushing and start it from the bottom surface of the die shoe as shown at (*b*). This approach allows the toolmaker to utilize the entire thickness of the shoe for aligning purposes and increases the extent of the press fit as shown at the right side of view (*b*).

This method may be used for guide pins as well as bushings where it is imperative to maintain squareness between assembled parts.

Cliff Bossmann
Dayton Chapter





Double-Action Clamp

This clamping arrangement is effective, especially for operations such as shaping and milling, because it not only holds the workpiece horizontally but also secures it against vertical movement. The hold-down action is the result of the use of diagonal surfaces on the holding block against which the lower sides of the clamps are compressed by the rod and nut which hold the unit together.

With a workpiece in position, when the nut is tightened the end clamps not only press into the workpiece but also have a tendency to move in a downward direction. Thus the workpiece is pulled down against the rest surface. Springs hold the clamps away from the part during loading and unloading. A pin in the holding block prevents the rod from turning when the nut is tightened.

F. C. Elmo
Dayton, Ohio

Repairing Bored Holes

To avoid reboring of holes slightly out of parallel with construction faces a method of scraping was devised in gagemaking which saved considerable boring time and expense.

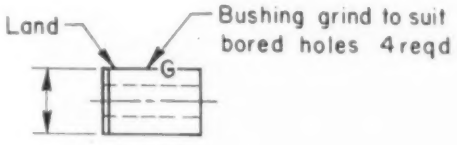
The part is a gage with four 0.500-inch holes with a plus or minus tolerance of 0.0002 inch. After the holes were checked by a height gage, gage blocks and plug gage it was found that the 2.000-inch centerline dimension was in tolerance but the holes were tilted and out of parallel with respect to face *A* as shown in the accompanying sketch. The error of 0.0006 inch on holes *X* was evenly divided between faces *B* and *C*.

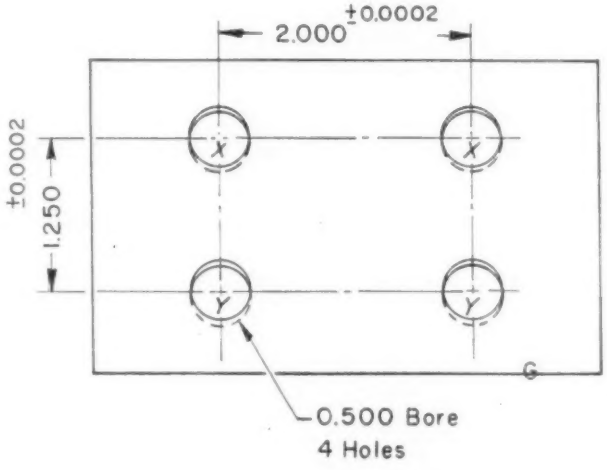
To correct this condition the holes were scraped with a three-cornered hand scraper to straighten the holes. An area of slightly over 180 deg was covered at a time. Approximately $\frac{1}{16}$ inch was left as a land as shown in the end view. This land served as a pivoting point and helped control the 1.250-inch dimension.

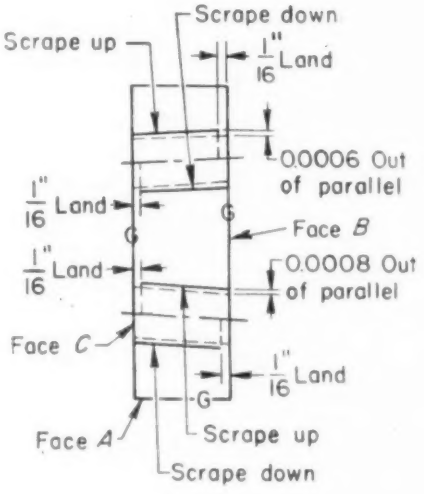
Prussian blue was applied on a 0.500-inch plug gage which was then inserted in the holes to mark the high spots remaining to be scraped. This way an elliptical condition in the holes was avoided. After parallelism was secured it was found that the 1.250-inch specification checked out as 1.2496. To bring this into tolerance holes *Y* were scraped slightly more than 180 deg in a downward direction the entire length of the holes, including the $\frac{1}{16}$ inch land.

After this correction, four hardened bushings were pressed in the gage. Slight remaining errors were corrected using the preceding method on the bushings.

Raymond O. Andrews
Detroit Chapter







Finishing Spherical Gages

For gaging purposes a ball was required to be within 0.0002-inch tolerance, the spherical diameter being 0.906 inch. Since this is not a nominal size some means of producing the ball had to be improvised because of limited facilities in the shop. No machine marks were permissible and a highly polished surface was required. The type of gaging allowed a $\frac{1}{4}$-inch stem on the ball as shown in the illustration.

First the part was machined with a conventional radius attachment on a lathe compound. At this stage the ball was left at 0.908-inch spherical diameter, giving 0.002 inch for finishing and polishing.

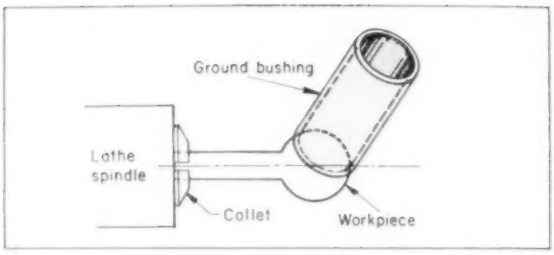
From here on the problem was to remove machine marks, heat treat, lap to size and polish while maintaining the spherical shape. The solution involved the use of a hardened and ground steel bushing as a scraper. One which was stocked as a component die part was found to be of suitable size. The bushing must be perfectly round as this is what controls accuracy of the sphere. It should also be internally ground.

The bushing is held on the sphere with the part revolving at 60 sfpm. The sharp edge of the ground bushing acts as a scraper. Hand pressure is applied and the bushing is rocked back and forth over the surface of the ball, with the operator making certain to pass beyond center. A sulfurized cutting oil is

used during the operation. The ball is left oversize so that polishing and lapping can be performed after heat treatment.

Finished in this manner, the gage produced was found to be within the required tolerance and accurate in shape when checked on a comparator.

W. J. Pentesco
Niagara District Chapter



Production Washing Machine

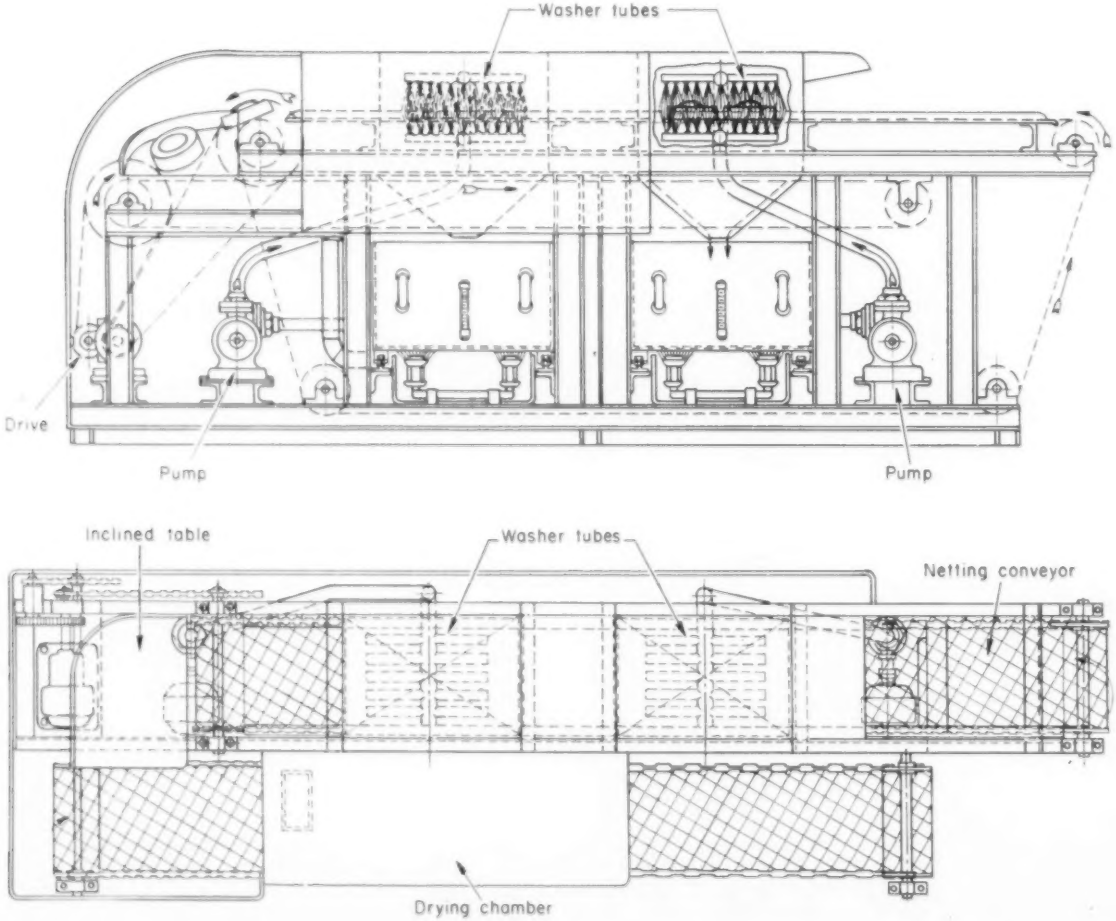
Suitable for use in small or medium-sized contract shops, this washer will handle parts on a production line basis, yet can be economically constructed of materials at hand or readily available. It was originally designed for cleaning drawn sheet metal shells after grinding and polishing operations, but it will clean a wide variety of parts efficiently.

The parts to be washed are loaded on the conveyor-belt of wire netting. The parts are conveyed to the left and come into the chamber enclosed by sheet metal, in which a series of steel tubes are mounted under and above the wire netting. There are many small holes drilled in the pipes and hot, soapy water is forced through the holes under high pressure. Two pumps supply the water pressure.

The workpieces proceed through the wash chamber and to the left end of the conveyor. There they are shunted off to a reverse conveyor by means of a half-round, inclined table. The reverse conveyor carries the parts through a drying chamber from which they can be conveyed anywhere in the plant.

The machine frame can be inexpensively made of angle iron, U-channels or flat iron. In the washer shown, water was heated by oil but gas or electricity may be used.

Hjalmar Dahl
Upplands Vasby, Sweden



TOOL LIFE

radiometric methods accelerate testing

By F. J. Daaseh*
S. L. Elsler
W. D. McHenry

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Rock Island, Ill.

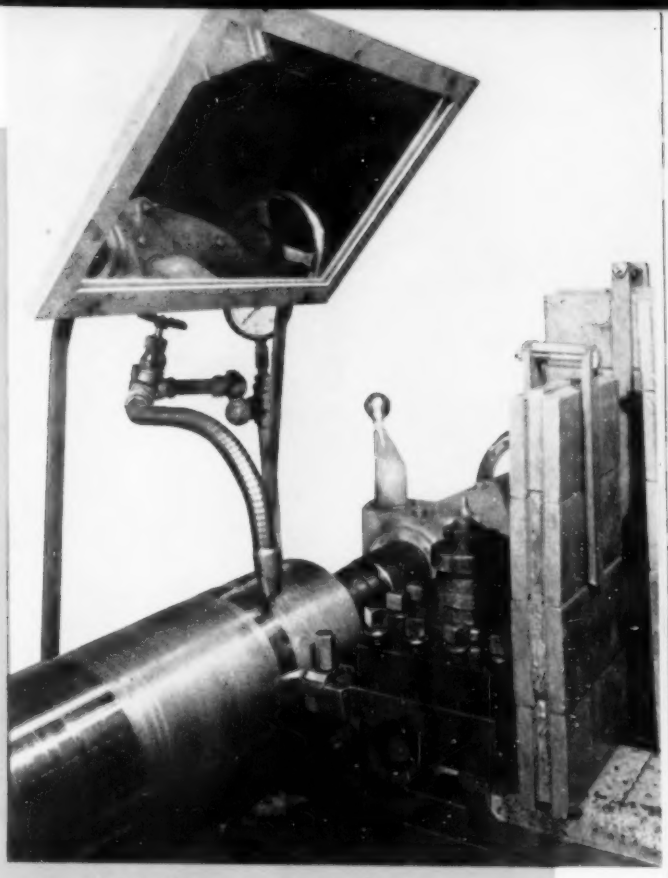


Fig. 1. Shielded setup for machinability studies with radioactive tool bits. Part of protective shield has been removed to show tool. Cutting progress is observed with mirror.

USUALLY, tool life is determined by machining until complete tool failure occurs or until a predetermined amount of flank wear is noted. Either method requires considerable work in order to bracket commercial applications. Also, there are numerous variables which influence the result and must be controlled. Accordingly, a dependable method that reduces the work involved and the number of variables in the test is desirable.

Merchant, Ernst and Krabacher[1] as well as Colding and Erwall[2] have demonstrated the feasibility of using irradiated cutting tools for this type of test. With radiometric techniques, the activity which is transferred from the tool to the chips is a measure of relative rate of tool wear and tool life.

Work which has been done with irradiated cutting tools has demonstrated that a considerable saving in time and material can be effected. In addition, the method, *Fig.* 1, has extreme sensitivity and permits a comparison of tools or materials under more stable conditions than with conventional methods. The present investigation was initiated to evaluate the radiometric method, compare results with those obtained by other methods and investigate variables not previously studied.

Cutting Tools: The tool bits used were of two types; namely, 18-4-1 high-speed steel and sintered carbides. Since the high-speed steel bits were cut from the same piece of tool steel and the sintered carbide bits were from the same lot, the resultant specific activities after irradiation could be assumed to be the same for bits of the same material. The bits were ground on both ends in accordance with the specifications listed in the tabulation to provide two cutting edges per tool. The high-speed steel and carbide bits were irradiated in the Oak Ridge nuclear reactor. Based on the known composition of the tools, the effective tracer radioisotopes were identified and the resultant activity calculated for each tool bit material.

Tool bits were mounted in the toolholder shown in *Fig.* 2. The top clamp is shaped so that each bit is held in exactly the same position. The mechanical type of holder made possible the use of compara-

*Senior member ASTE Tri-Cities chapter.
[1] References are listed at end of article.

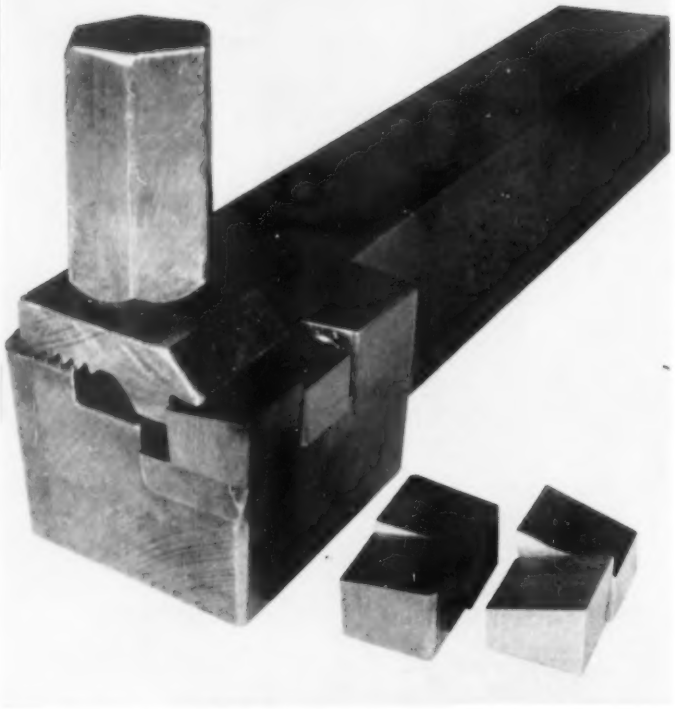


Fig. 2. Toolholder for irradiated bits that are sharpened to have two cutting edges.

tively small pieces of tool material providing a definite advantage from the radiological standpoint. With less material irradiated, the smaller the total amount of activity in the piece, and consequently the less radiation shielding required for personnel protection.

Test Equipment: All machining was done on a 16-inch lathe equipped with a variable-speed drive. The cutting fluid used with the high-speed steel tool bits was a water-soluble oil with a water-oil ratio of 20:1.

The work materials were annealed molybdenum alloy steel, FS 4340, and annealed boron alloy steel, FS 86B45, with an average Brinell hardness of 222 and 201, respectively. Photomicrographs of the work material indicated similarity of the microstructures.

Cutting Tool Geometry

Characteristic	HS Steel	Carbide
Back Rake, deg	0	0
Side Rake, deg	15	6
Side Cutting Edge Angle, deg	0	0
End Cutting Edge Angle, deg	5	6
Side Relief, deg	5	6
End Relief, deg	5	6
Nose Radius, inch	0.005	0.040
Chip Breaker	None	Clamped

The test log, the toolholder and the radiation shielding as set up for a test run are pictured in *Fig.* 1. The shield is constructed of lead bricks 1½ inches thick and especially designed for radiation shielding. Part of the shield has been removed so that all components could be included in the photograph. The mirror permits the operator to observe cutting operations from behind shielding.

Survey meters, pocket and finger dosimeters, and film badges were used throughout the test to monitor the radiation received by operating personnel. Since the dosage received is a function of both time and radiation intensity, and with an intensity of approximately 20 milliroentgens per hour (mr/h) one foot from the outside surface of the shielding, operators could remain at this point for three hours per day without exceeding the maximum permissible dose. Since the radiation intensity decreases as the square of the distance, the time limit is considerably extended when the operator stands farther away from the lead shield.

Test Methods: Studies were made to determine the time required for tool wear to become constant (the "break-in" test), and the influence of various feeds and speeds upon tool wear. The cutting time of the tests varied from 10 to 30 seconds.

Since the chips produced by the high-speed steel bit were not continuous under the test conditions, a chip container was installed. This consisted essentially of a box which enclosed the tool bit and holder except for a small opening at the point of contact between the bit and the test log.

The lower part of the box contained a drawer so

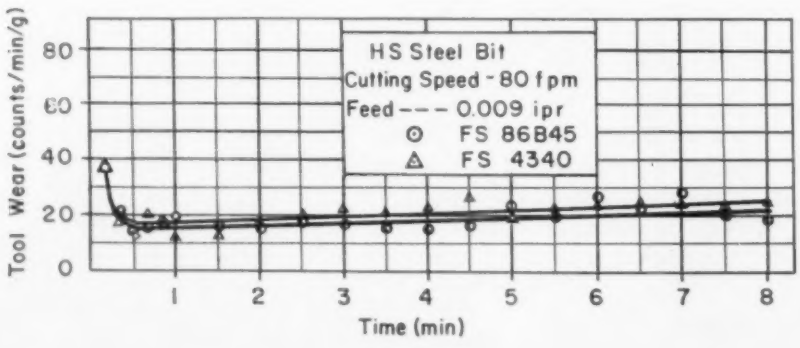


Fig. 3. Typical plot of tool wear vs time for a high-speed steel bit.

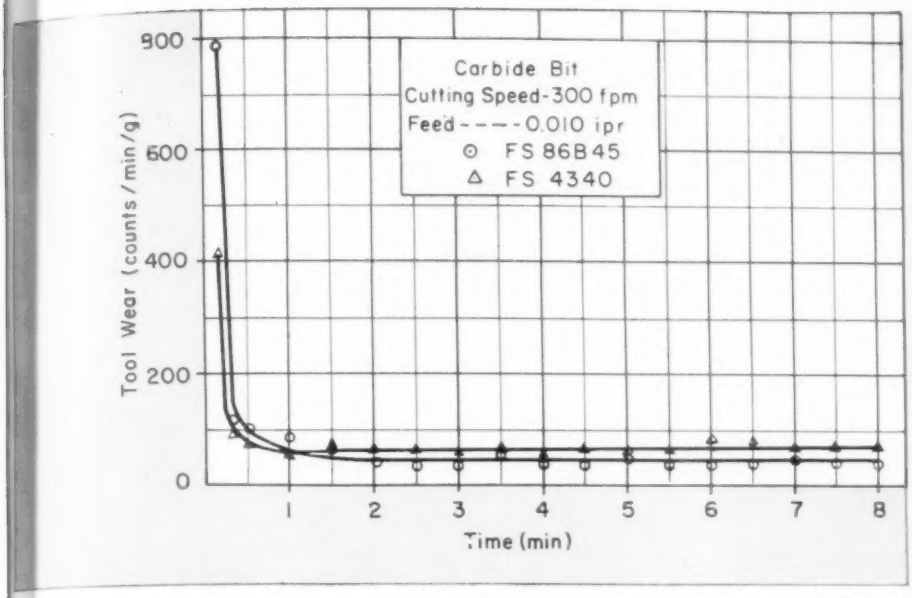
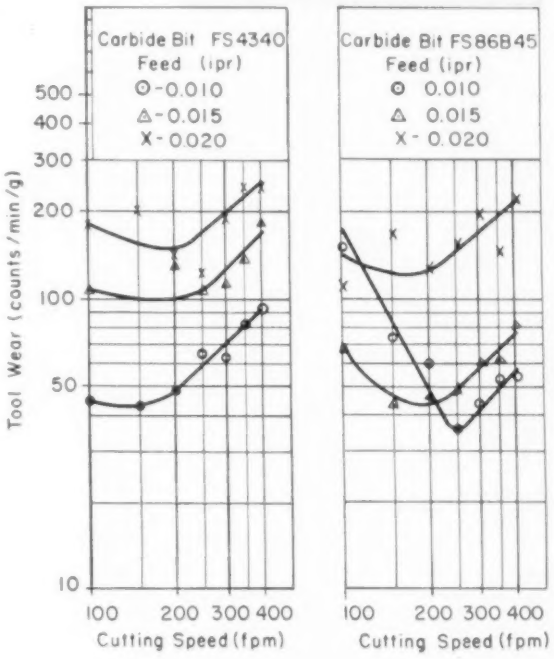


Fig. 4. (left) Typical plot of tool wear vs time for a carbide bit.

Fig. 5. (below) Effect of feed and cutting speed on wear of carbide bit while machining FS 4340 and 86B45.



that the chips could be removed without disturbing the machine setup while the top of the box was hinged for access to the tool and observation of the tool while making adjustments. Radiation intensity of the high-speed steel bit was sufficiently low to permit direct observation of the tool bit for brief periods of time and removal of the drawer by hand.

It was unnecessary to use a chip container while machining with the carbide bit since a continuous chip was formed. These could be retrieved from the chip pan of the machine by use of a long hook.

Since a cutting fluid was used with the high-speed tool bits, the chips were thoroughly cleaned before the counting determinations were made. Cleaning was done by washing in hot running water, drying in a forced-draft oven and degreasing in a trichloroethylene vapor degreaser. Most of the chips produced by the high-speed steel tool bits were short enough for use in these determinations. Longer chips were broken up into lengths of $\frac{1}{4}$ inch or less. Because a cutting fluid was not used with the carbide tool bits, the chips were merely degreased to remove any adhering oil which had been picked up from the chip pan of the lathe.

Preliminary tests indicated that the first few inches of each carbide cut gave a higher counting rate than the remaining length. Therefore, only the last portion of the continuous chip was broken for counting purposes. All counting rates were determined with a mica-window Geiger Müller counting tube operated in conjunction with an automatic sample changer, scaler and recording unit.

The tube is mounted inside a lead shield with walls $1\frac{1}{2}$ in. thick to provide shielding from cosmic radiation. Since this type of tube affords great sensitivity for beta rays, only a small amount of activity is needed in the sample to provide a sufficiently high counting rate.

Five-gram samples of chips were used for all counting rate determinations as these provided a convenient size and a sufficiently high counting rate. Samples were counted for a predetermined number of counts. Background counts were made at the beginning and end of each set of samples. Results are the average of two counts and are given in counts per minute per gram of chips.

Other investigators have shown by means of autoradiographs that the wear products and activity therein are found on the surface of the chips. Therefore, when the feed was varied for some of the tests, it was necessary to correct for the reduced

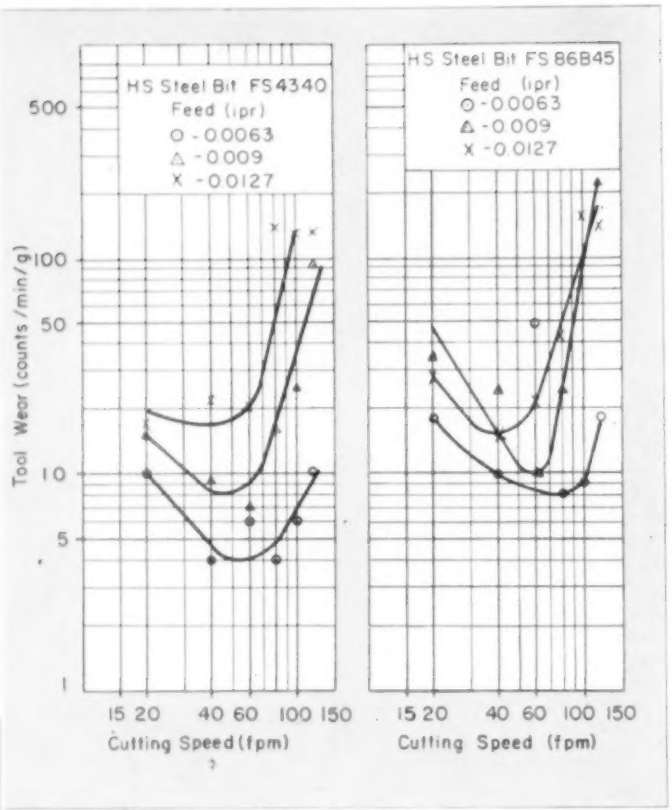


Fig. 6. Effect of feed and cutting speed on wear of high-speed steel bit.

area of a given weight of chips due to the increased thickness.

Results: Comparison of the curves for the "break-in" tests indicates that tool wear is similar for FS 4340 and FS 86B45, at least under the test conditions indicated. These facts tend to corroborate the findings which were previously reported in tests conducted by the conventional method where machining was done for a predetermined amount of flank wear[3]. Typical curves are depicted in *Figs.* 3 and 4.

Tool wear of the carbide bit was high during the first minute of "break-in" but leveled off to a consistent value. For the high-speed steel bit, break-in wear was greater than the wear after the first minute but of a much lower magnitude than with carbide bits.

Information derived from these break-in tests indicates that tool wear, after the initial break-in period, may be considered as remaining constant over an appreciable interval of time. This fact validates short-time tests made with the same tool on different materials.

Test results of the influences of cutting speed and feed on tool wear are presented in *Figs.* 5 and 6. The following salient points are evident from an examination of these curves:

Tool wear increases as the feed is increased. This is to be expected since a greater amount of material is removed per unit time interval at the higher feed. Disregarding other economical factors, optimum speed for a specific feed is indicated by the low point of the curve.

The optimum speed, on the basis of tool wear, for machining FS 4340 steel is approximately the same for all feeds within the limits of this test. However, this is not true for machining FS 86B45 steel as the optimum speed seems to decrease as the feed increases.

Generally, the amount of tool wear at a particular feed decreases as the optimum speed is approached and then increases as the speed is increased. This initial decrease is generally more pronounced when machining FS 86B45 steel than FS 4340 steel.

ACKNOWLEDGMENTS: The authors are indebted to the Office of Chief of Ordnance, U. S. Army, for permission to publish these data and to associates at the Rock Island Arsenal Laboratory for their assistance during the work.

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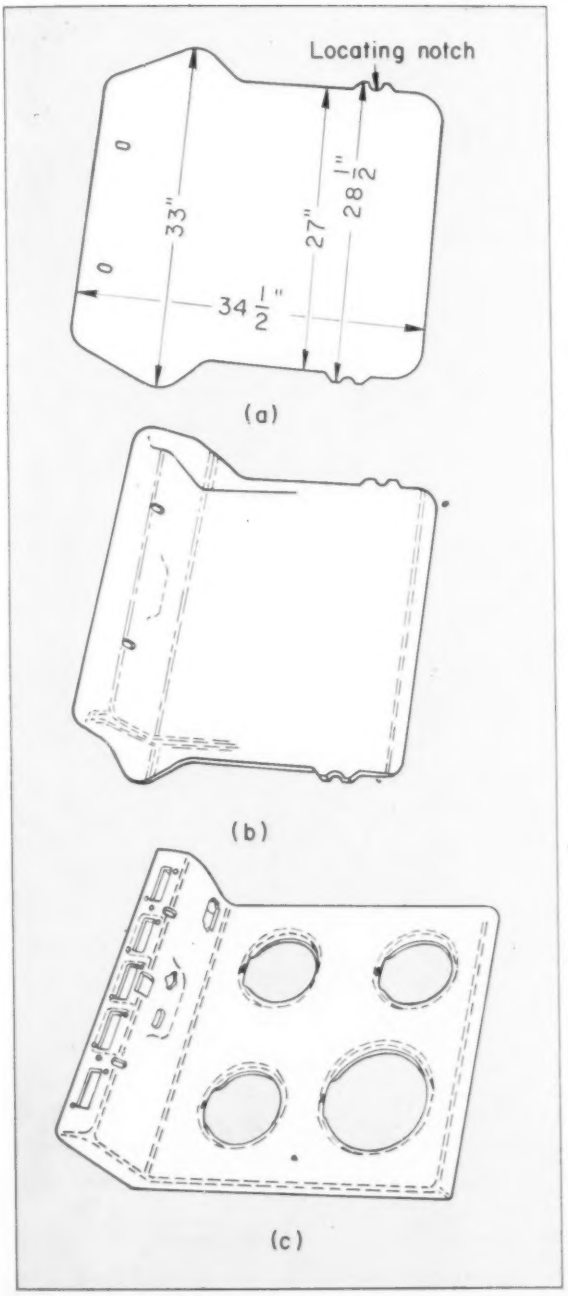
Gaging Steel with X-Ray

THICKNESS of sheet steel gage is being measured by X-ray at Rochester Products Div. of General Motors Corp. where GM steel tubing is made. The gaging device consisting of a chassis console, an X-ray source and a pickup—is attached to a sheet metal slitter. Thirty-six inch steel sheet is fed into the slitter. As the steel enters the slitting unit, the X-ray source, mounted with the pickup, is slid back and forth across the steel to gage any section of it from outside edge to center. Under this method, the steel is run through the slitter at 600 fpm and is gaged continuously through its entirety. A signal lamp immediately alerts the operator when any out-of-tolerance portion is crossed.

combination cam dies

assure economical production



One of many production case studies presented in the forthcoming *Die Design Handbook* is discussed in this article. The study illustrates how the appliance division of General Electric Co. applied proved principles of die design to assure production efficiency.

DRAWING AND FORMING large and irregular shapes require dies that are carefully designed. This is especially true of the shape of the blankholder ring and the positioning of the part in the die to obtain a reasonably uniform depth of draw or to form the part with a minimum number of dies. Size and irregular outlines in plan and cross-sectional views present problems in the control of metal flow of parts such as the one-piece electric range top and backsplasher, *Fig.* 1.

The blank, *Fig.* 1*a*, is produced in the first press operation by a blanking die that trims three sides of 0.59-inch vitreous enameling steel stock that has been sheared into 34 x 35½-inch sheets. Two semicircular notches having different radii in the locating ears on the sides of the part fit locating pins of corresponding diameter and insure proper positioning of the blank in the first two forming dies. This positive blank positioning method insures that the burr is down and is formed inside the flanges. As the blank leaves the blanking die it enters power-driven rolls and is coated with a lubricant containing no paraffin or graphite so that it cleans easily and thoroughly for vitreous enameling.

The next operation forms the part as shown in *Fig.* 1*b*. The die which preforms the corner flanges, face, and top of the backsplasher and the front edge

Fig. 1. Workpiece in various stage: *a*; flat blank after trimming in a compound die; *b*, part after first forming operation; *c*, finished stamping.

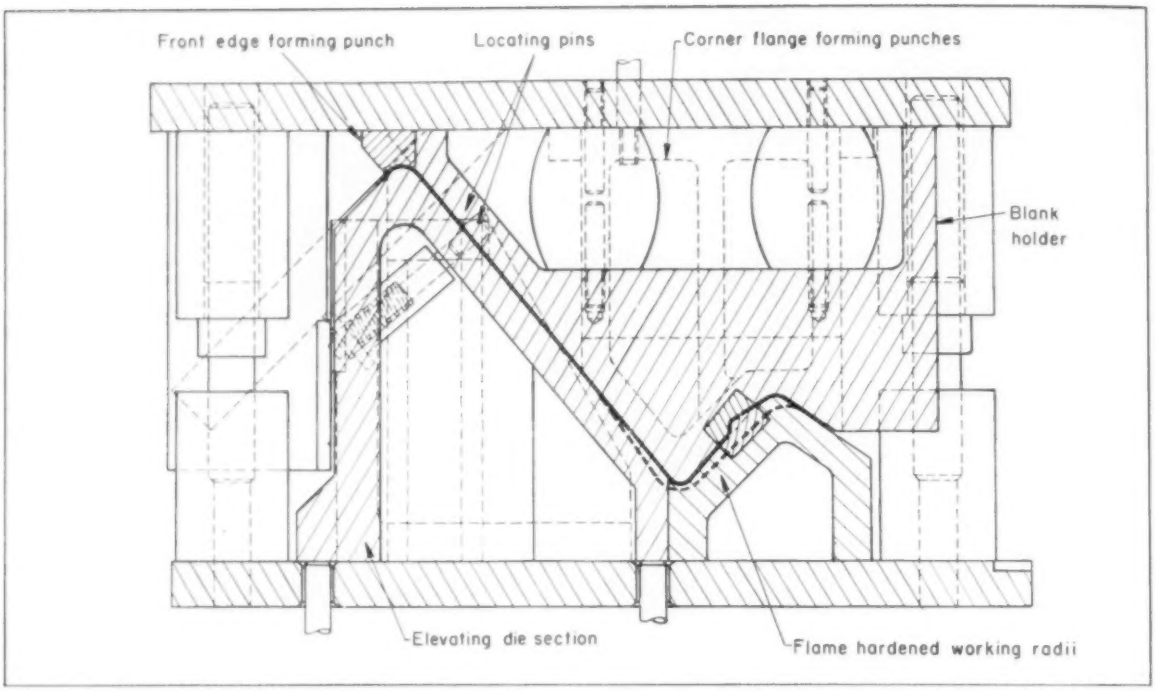
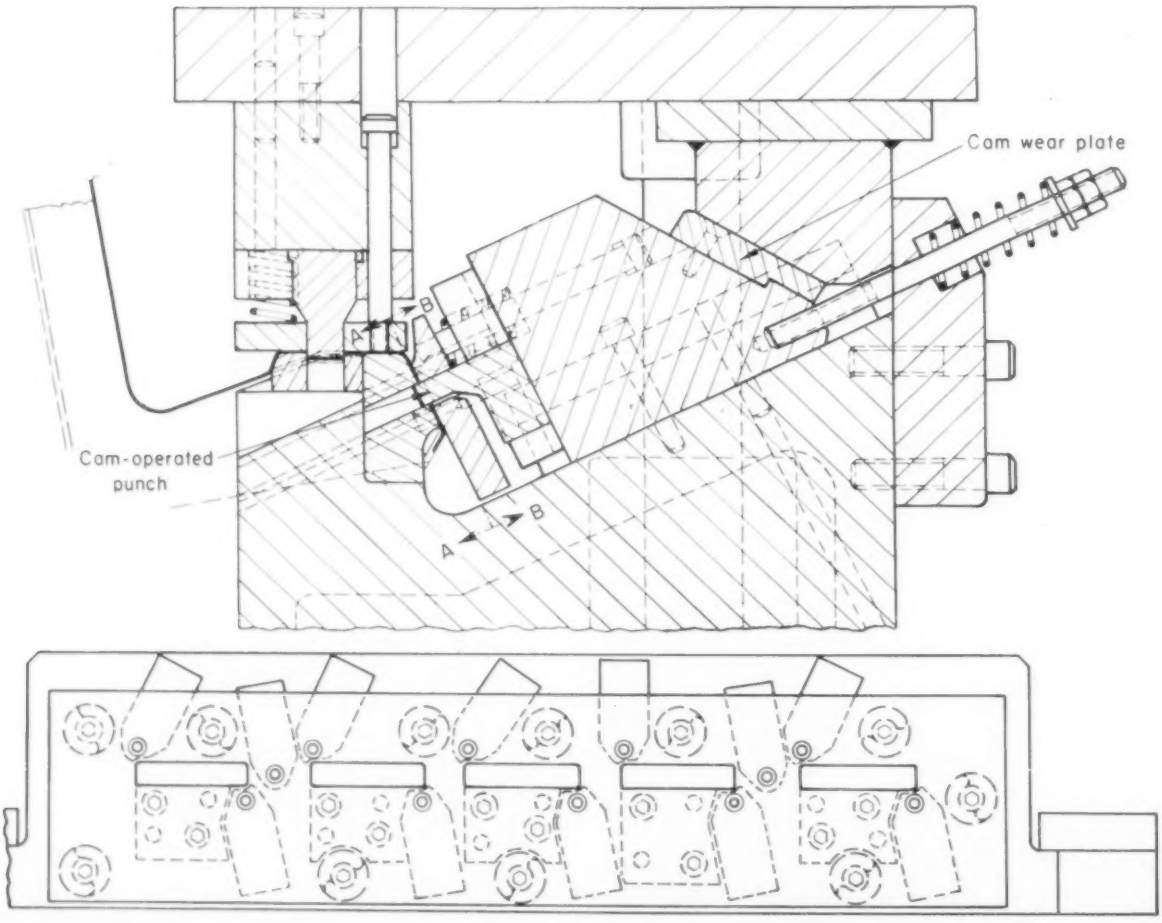


Fig. 2. Section through first forming die for shaping backsplasher and flanges.

Fig. 3. Section through piercing die, combining a conventional piercing action and cam-actuated piercing punch.



is shown in *Fig.* 2. The forming punch on the upper shoe is comprised of four sections. One section forms the front edge and two sections form the corner flange. The fourth section is the blankholder which functions between the three punches, since the forming operations are performed on the outer edges of the blank. Pressure is applied to the blankholder by four rubber pads. The blankholder also is used to bend the sheet to form the backsplasher and to emboss certain areas.

Two virtually foolproof locating pins position the blank on the lower die. The lower blankholder containing the locating pins is elevated by an air cushion to a sufficient height to permit the flat blank to be placed in position. When the die is open, the upper blankholder drops below the lower edges of the fixed members in order to grip the stock. The locating pins recede with the upstroke, permitting quick removal of the workpiece.

After further drawing, piercing and embossing steps, another interesting die in the series, *Fig.* 3, pierces five rectangular slots and twelve holes in the top flange of the backsplasher. At the same time, two irregularly shaped holes for instruments are pierced in the face of the backsplasher.

The part is positioned in the die so that the two holes in the face of the part are pierced in the conventional manner while the remainder of the holes are pierced by a cam-actuated slide. Spring-loaded pads precede the punches and clamp the workpiece to the die, and also serve as punch strippers on the upstroke. Springs are utilized to return the slide for loading and unloading.

This die and other dies used in processing this part employ complex cam arrangements which combine several operations into one die so that greatest utilization is made of each stroke of the press. Unless cam-actuated dies of this type are correctly designed and built, they frequently cause high scrap loss, poor quality and production delays due to high maintenance. Sturdy, well-designed and accurately built dies, however, will prove to be economical and trouble-free.

Additional piercing and embossing operations are performed on the part by the die shown in *Fig.* 4. A conventional vertical punch cuts a hole in the face of the backsplasher. A cam-operated punch installed at a 45-degree angle pierces a rectangular hole at the flange radius and the other cam-actuated sliding block embosses a circular indentation around four of the instrument mounting holes. Other dies complete the piercing, flanging, trimming and forming of the part.

Presses used are single-action type equipped with die cushions. They have a large shut height to make them adaptable to many operations. Therefore, riser blocks are used with many of the dies.

Since the drawing and forming operations are not severe or critical, no annealing operation is required on the finished part, *Fig.* 1*c*. In fact, temperature of the vitreous enameling operation is sufficient to stress relieve the panels. This illustrates how advantages can be secured from auxiliary processes to achieve production efficiency. A production rate of 200 pieces per hour is attained with manual operation of presses combined with separate gravity and power conveyors between press operations. However, all presses are arranged in line, front to back, and erected over a large press pit. This is to facilitate rearrangement and permit installation of automatic feeding and removing devices when a greater production rate is required.

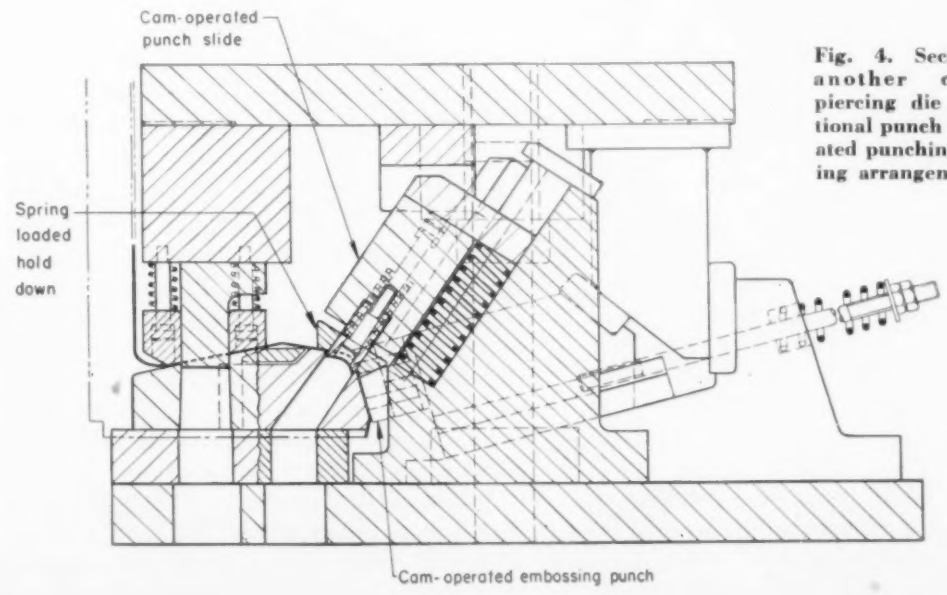


Fig. 4. Section through another combination piercing die with conventional punch and cam-actuated punching and embossing arrangement.

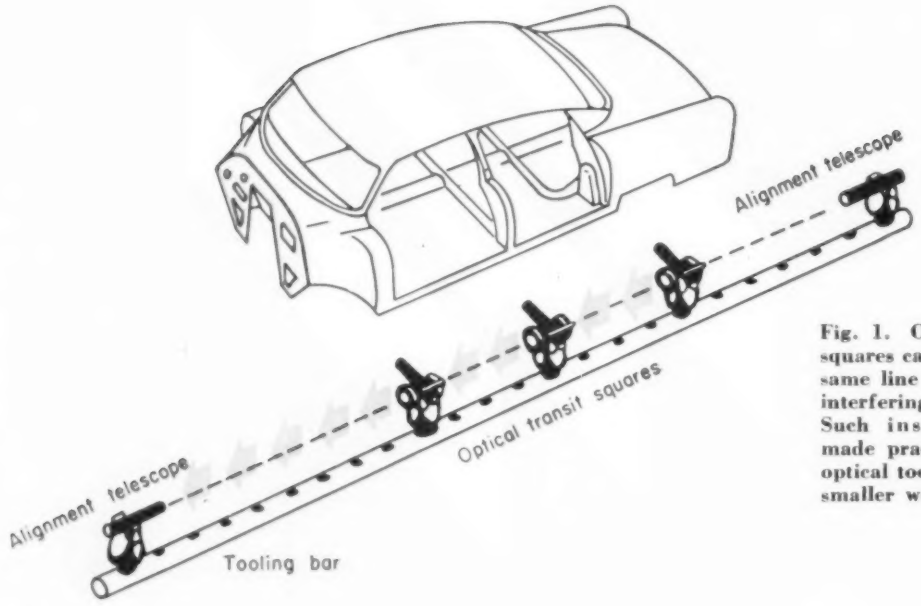


Fig. 1. Optical transit squares can be used on the same line of sight without interfering with each other. Such instruments have made practical the use of optical tooling methods on smaller workpieces.

OPTICAL TOOLING

new equipment and techniques broaden use

By W. L. Egy

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ment of an optical reference line parallel to one axis of the object being worked and then the establishment of optical planes at right angles to the basic reference line. These references can be quickly and precisely set with errors in positioning and alignment held to less than 0.001 inch. Modern optical tooling features high accuracy, efficiency and convenience with up to 90 percent savings in setup time.

OPTICAL TOOL-ENGINEERING is the application of surveying principles to the erection of equipment or checking of production operations. Each increase in the precision of individual optical tools permits an increase of the area over which precise measurements can be made. Optical tooling made its most dramatic progress in bomber assembly work during World War II but is now being successfully applied in making precise measurements for automotive, *Fig.* 1, machining and lofting work. Measurements can be made on large or small structures, jigs and mock-ups with either symmetrical or irregular shapes.

Essentially, optical tooling enables the establishment of an optical reference line parallel to one axis of the object being worked and then the establishment of optical planes at right angles to the basic reference line. These references can be quickly and precisely set with errors in positioning and alignment held to less than 0.001 inch. Modern optical tooling features high accuracy, efficiency and convenience with up to 90 percent savings in setup time.

Optical Instruments

Although regular surveyor's instruments were sufficiently accurate for original optical tooling purposes, the need for specialized instrumentation became apparent when it was necessary to position interchangeable parts accurately. Alignment telescopes are used to form the basic reference line, and jig transits or optical transit squares are used to set up planes perpendicular to the base line.

Alignment telescopes, *Fig.* 2, usually have powers of 30 to 75 magnifications and have a focus as short as 18 inches in some instances. Lines of sight are maintained in the exact mechanical center of the

tube throughout the entire focusing range.

Alignment scopes are sometimes mounted in Y's at both ends of an adjustable base. With an accurate level bubble mounted on the Y-bar, such a scope can be used as a precise level. Another type of mounting has a spherical ball built around the telescope, the ball being held in a fixed cup. The center of the ball maintains one end of the reference line when the alignment telescope is pointed on the target at the other end of the reference line.

Planes perpendicular to the main line of sight are usually established by the autoreflection principle. If a plane mirror is interposed in, and at right angles to, the line of sight, a sight through the alignment scope will be reflected back along its own path.

The alignment scope has a built-in target on its objective end that is aligned with the optical axis. This target can be picked up by the reflecting mirror of an interposed jig transit or other optical unit. This reflected image of the autoreflection target is then superimposed on the cross wire reticle, *Fig.* 2 E, of the alignment scope to show perpendicularity.

By following directions from an operator sighting through the scope, another operator aligns the transit so that its mirror reflects the image in a direct line. A perfectly aligned reflection is indicated when the internal cross wires exactly coincide with the pattern of the autoreflection target, *Fig.* 2 G. When the patterns coincide, the plane of the mirror is perpendicular to the alignment telescope's main line of sight.

Another method of squaring the mirror, called

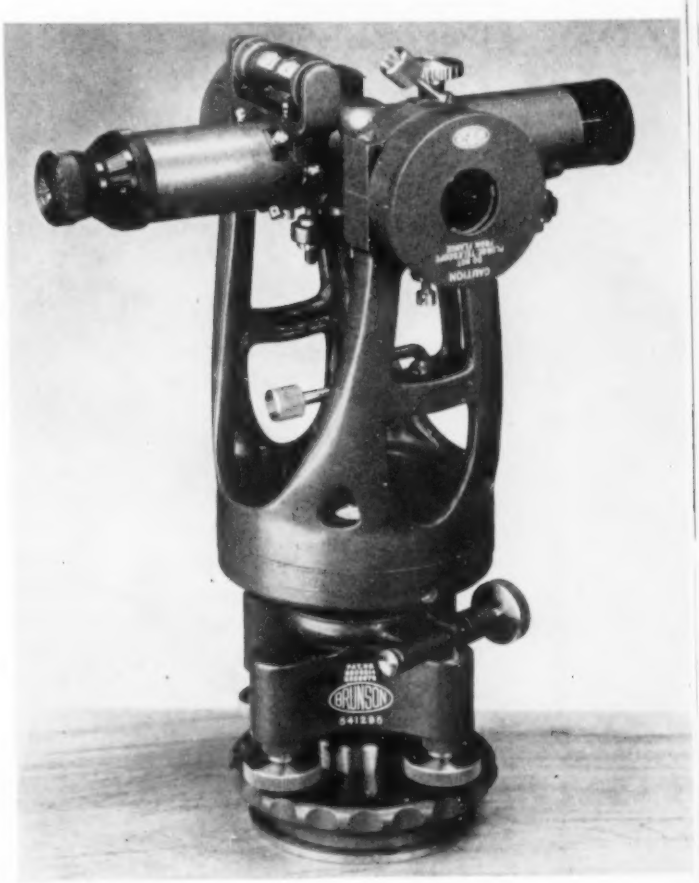
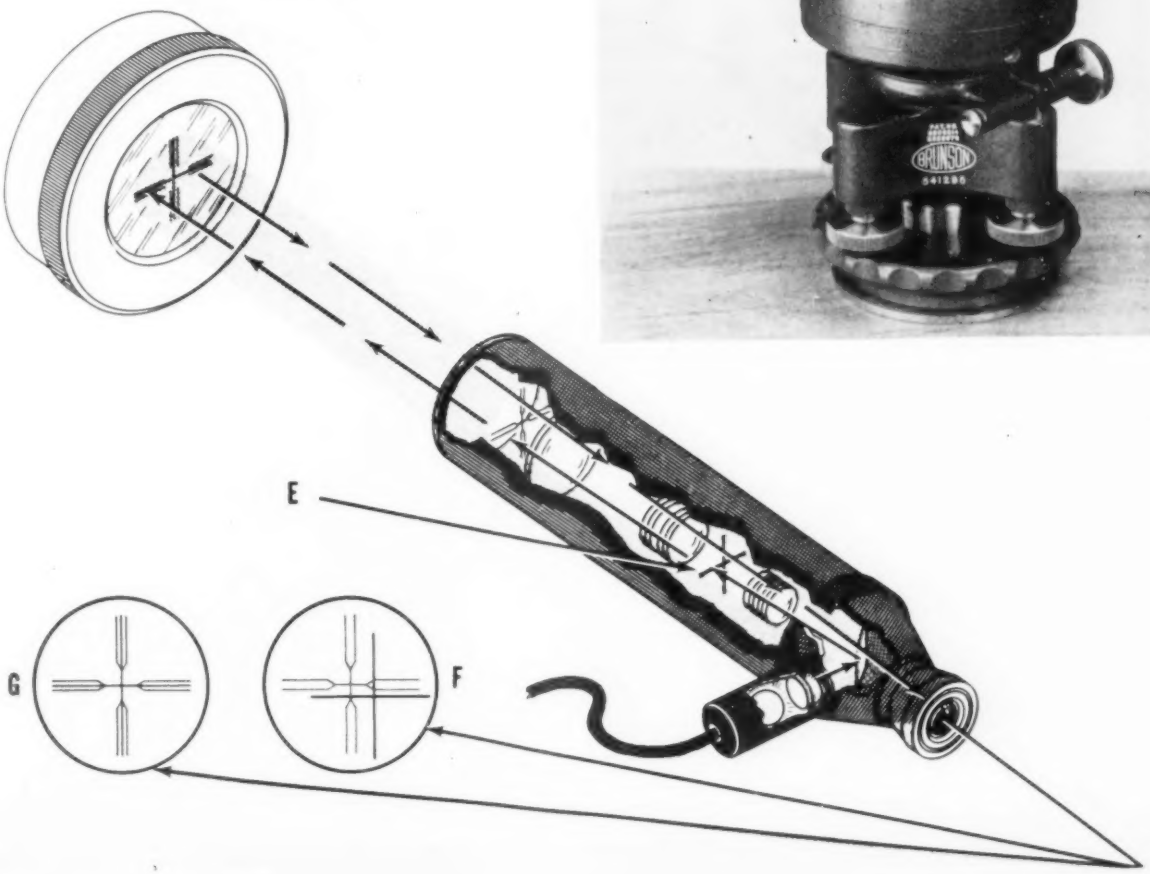
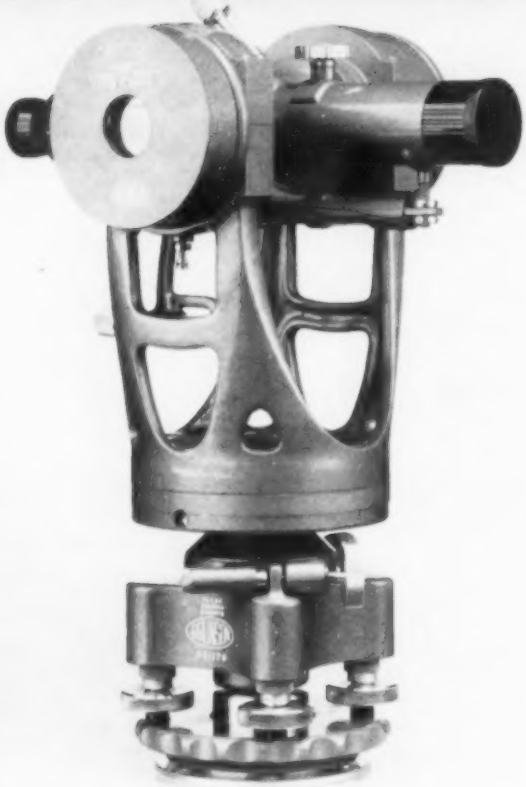


Fig. 2. (below) Planes perpendicular to the main line of sight of the alignment telescope are usually established by autoreflection. Errors of alignment are easily seen as at F.

Fig. 3. (right) A typical jig transit with a pivoted cross level bubble permits establishment of a vertical plane without additional equipment.





autocollimation, consists of illuminating the reticle in the alignment scope and focusing the scope for infinity. When used in this manner, the telescope projects the image of its cross wires to the mirror of a jig transit or optical transit square from which it is reflected back into the alignment scope.

Autoreflection methods have the advantage of matched patterns and permit the operator to select a given mirror when there are two or more on the line. Autocollimation cannot be used if there are two reflecting surfaces.

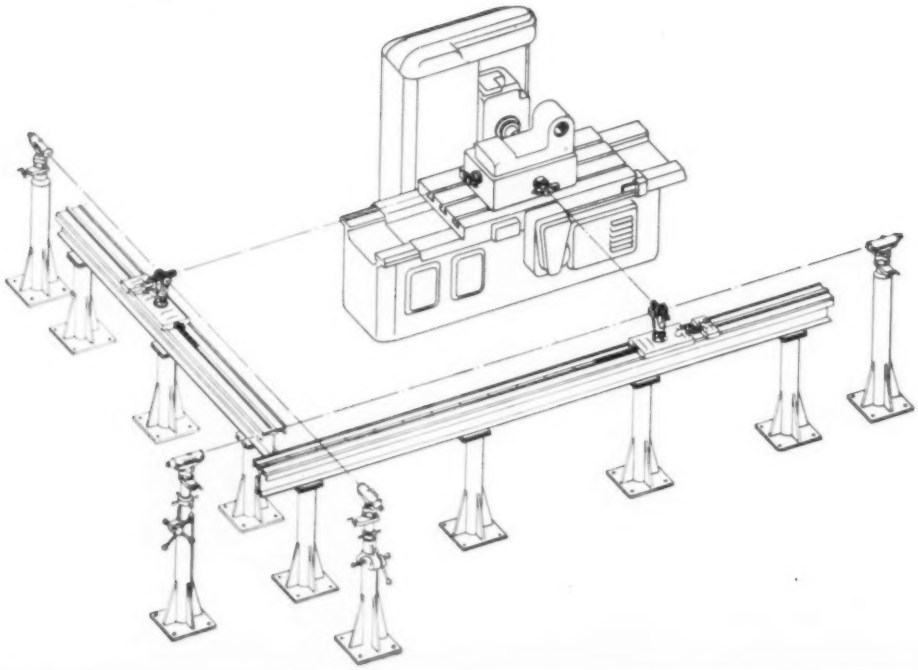
Modified for use in determining the true vertical plane of a structure or irregular shape, the jig transit, *Fig.* 3, is a special version of the engineer's surveying transit. It carries the scope in the same manner as its prototype but has no circular scales since angles are not measured directly.

Jig transits differ from surveying instruments because they have higher magnification and shorter minimum focus. The line of sight is in a perfectly straight line at all focal distances and passes through the exact center of the vertical spindle. To achieve such alignment, jig transit lenses can be adjusted and the scope can be shifted so it is directly over the center of the vertical axis. Built-up pentaprisms used

Fig. 4. (top) Axis of the optical transit square is hollow and capped by a window at one end and a partial mirror at the other.

Fig. 5. (left) Double-line targets insure accuracy and, if properly chosen, can indicate tolerances.

Fig. 6. (below) Large workpieces can be turned and realigned with high accuracy during machining.



with jig transits have greater accuracy than former solid glass prisms.

Such a transit has an adjustable mirror on one end of its horizontal axis. This optically flat mirror can be adjusted until it is exactly perpendicular to the transit's horizontal axis by observing any reflected image through the high-power alignment telescope and plunging the telescope of the jig transit. When properly adjusted, no movement can be observed in the reflected image when the telescope is plunged.

After the mirror has been adjusted, the jig transit can be set in the main reference line of sight. The transit is positioned by means of autoreflection, with the target of the alignment scope being reflected from the transit mirror back to the telescope. Careful work during setup insures the vertical plane being at 90 deg with the reference line to within one second of angle.

A right-angle eyepiece can be attached to the transit telescope so that overhead sights can be made easily. Such "elbow" eyepieces can be swivelled to any angle about the telescope axis. Addition of a pivoted level bubble, *Fig.* 3, parallel to the axis about which the telescope plunges, permits a vertical plane to be described by the jig transit without use of an alignment scope. The level bubble remains visible when the telescope is plunged and when the bubble remains stationary, it indicates that a true vertical plane is described. When a prismatic bubble unit is used on the transit, a horizontal plane can be described and the instrument can be used as a precision level.

Optical transit squares, *Fig.* 4, have been developed to permit the simultaneous use of a number of transits on the same optical reference line. Thus, several vertical planes can be established and used at the same time. Key feature of the transit square is its hollow axis. One end of this aperture is closed by a clear, flat window, the other by a partially coated mirror that also serves as a window. The combination of transparency and reflectivity makes possible the use of four instraments on one line of sight.

An alignment telescope can be focused in turn through the window or off the mirror of each of these instruments to insure squareness with the reference line. The scope can be sighted through all the optical squares to its own reference target to be sure it remains on the original point.

Optical squares can be checked at any time without removing them from the tooling bar. The correct adjustment of a square can be proved by rotating the instrument 180 deg horizontally and then plunging the telescope. The unit is aligned with the same mirror surface but reflected from the back of the mirror so the original sighting can be quickly checked. Optical transit squares, as well as jig transits, have plugs on the bottoms that are ground on the instrument centers. Instruments can therefore be accurately repositioned after being used in some other location.

Increasing variety of applications for optical tooling to industrial alignment problems, such as setting points in assembly work, gaging wear in tools, dies, etc., has brought the development of a number of accessories for still greater accuracy, versatility and operational convenience.

Optical micrometers consist of a glass block, with flat and parallel sides, mounted on the front end of

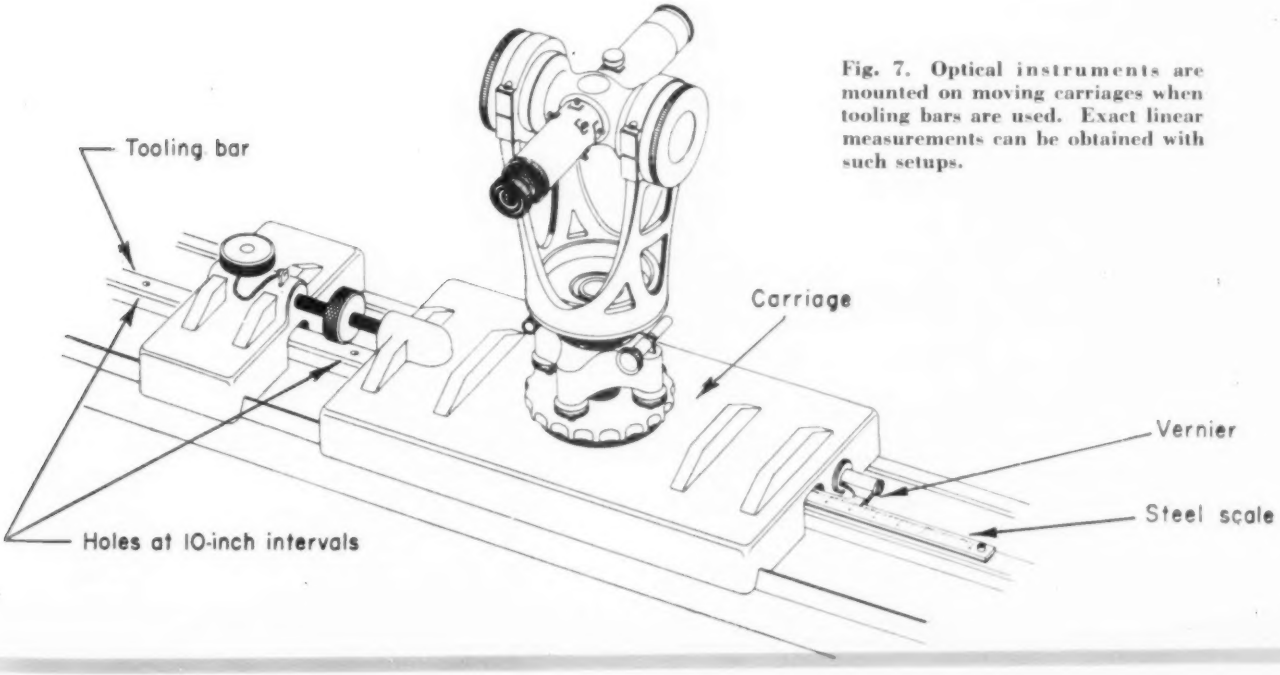


Fig. 7. Optical instruments are mounted on moving carriages when tooling bars are used. Exact linear measurements can be obtained with such setups.

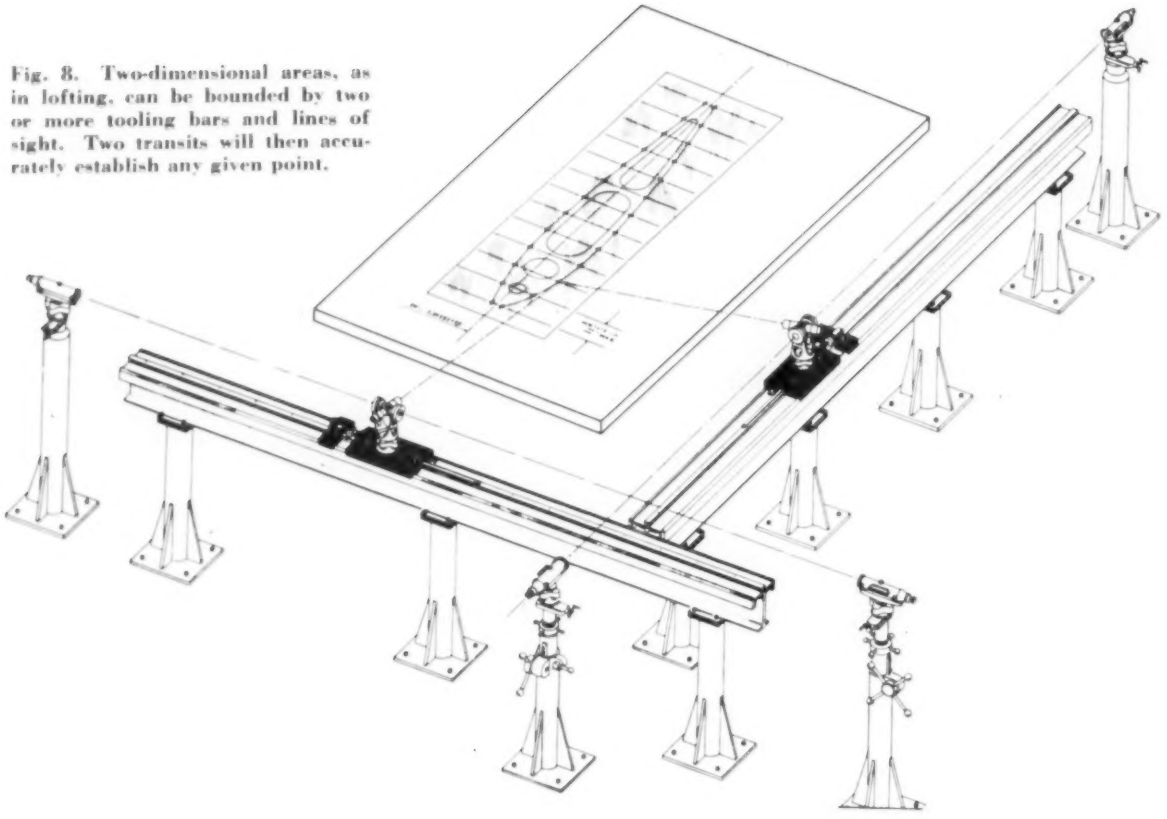


Fig. 8. Two-dimensional areas, as in lofting, can be bounded by two or more tooling bars and lines of sight. Two transits will then accurately establish any given point.

a telescope. Tilting the block on its pivots shifts the line of sight, but keeps it parallel to the original position. A graduated drum or dial indicates the amount of shift. Shifts can be to right or left as much as a tenth of an inch or, in another plane, up or down the same distance. The scale on the operating drum is graduated in thousandths.

Since the line of sight is always kept parallel, an accurate measure of the offset is obtained, regardless of the distance to the target. For regular use on the line scope, two optical micrometers can be attached—one for vertical movement and the other for horizontal.

Another method that is commonly used for making similar measurements is to attach a target to the carriage of a height gage, micrometer or other precision scale. The vernier carrying the target is then moved until the target is in line with the sight of the telescope. Readings are made in the normal way on either the vernier or the micrometer that is an integral part of the gage.

An essential part of accurate alignment for all optical instruments is the selection of the target. When the cross wires in the telescope reticle are single lines, the target should consist of double lines, *Fig.* 5. Operators can easily center cross wires accurately regardless of the amount of white space between the target lines. Sights can be repeated at a distance of 10 feet to within less than 0.001 inch with such targets.

When target line spacing is properly chosen, targets can be used at key spots to indicate tolerances. Distance and line spacing are predetermined so that when white shows between the lines on both sides of the cross wire, measurements are within required tolerances.

One of the most difficult optical tooling problems has been the accurate measurement of linear distances, i.e., parallel to the main reference line. A large amount of such work is now being accomplished by the use of length bars having micrometers on the ends. Such errors as are found in this method are caused by sagging of the rods, difference in operators and expansion differential due to temperature changes.

Tooling Bars

A new method for achieving accurate linear measurements is based on use of a tooling bar, *Fig.* 6. Tooling bars longer than 100 feet are now regularly used. The bar consists of a structure that will support a carriage for the transit. The carriage, *Fig.* 7, slides back and forth on the bed and has a socket that locates the jig transit or optical transit square Plugs of the transits fit accurately into the carriage socket. For routine work, where the same stations are used day after day, location can be achieved by plugging the carriage into special holes bored along the tooling bar.

For general work, where measurements may be of any value, the tooling bar can be jig-bored at regular 10-inch intervals. A hardened steel scale with plugs 10 inches apart can then be placed on the tooling bar between any pair of holes. Either a vernier or a micrometer on the carriage that supports the transit can be used to give the reading for proper location. In this way, any point on the bar can be measured to within 0.001 inch throughout its entire length.

When possible, the tooling bar should be made of a material with the same coefficient of expansion as the work being measured. Contrary to first impressions, accuracy of the work does not depend on the bar straightness. As long as bar deflection does not materially change the length of the bar and as long as any part of the transit mirror remains in the main line of sight, the instruments can be used accurately. Transits are always positioned with reference to the main line of sight.

For taking measurements in two directions in a horizontal plane, *Fig.* 8, two tooling bars can be set up at right angles with jig transits or transit squares placed on both bars. Exactness of the right angle between the two line scopes can be checked in several ways. One of the most convenient methods is to slide the jig transit or optical square to the intersection of the two main reference lines. The transit can then be set at 90 deg to one of the lines by using the autoreflection method and the telescope used for sighting into the other line scope.

The same system can be extended to include all four sides of a square or rectangular area. By using line scopes on each side and transits or each line, measurements can be taken on all four sides of any object or structure that could not be conveniently measured by any other means.

A basically two-dimension system can be extended to permit measurements of the third dimension, *Fig.* 9. A precision level, or levels, set up on one or more sides of the structure will establish a horizontal plane and measurements can be taken downward from this plane by using a height gage with a suitable target.

Optical tooling application is spreading in many directions. In addition to its proved use in the aviation industry, optical tooling is: measuring three dimensions of contour maps, aligning strip-mining and conveyor machinery, locating key points on automobile bodies, measuring contours of rockets, aligning paper making machines and printing presses, and checking the drilling of straight holes through 30-foot steel forgings.

In all applications, the principles are the same. A fixed reference, such as index points, a line of sight or a plane, is adopted. Such references should be convenient to use. Systems must include a means for transferring lines, planes or measurements from the fixed reference to the points to be located. Each system must provide a method for measuring errors or tolerances at the final points. Installations of optical tooling will be simple or complex but all will pay for themselves in time and expense saved.

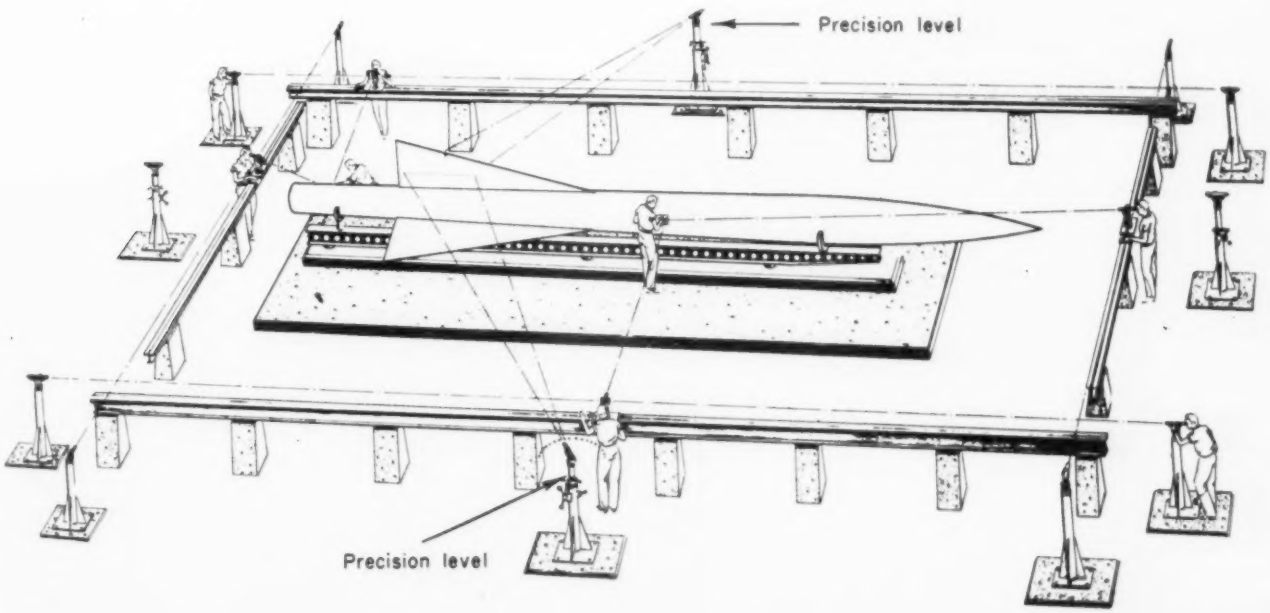


Fig. 9. By adding precision levels to the setup of *Fig.* 8, measurements can be made in all three dimensional planes.

designed for

PRODUCTION

Aluminum Contours Milled on Engine Lathe

By Al Minetti*
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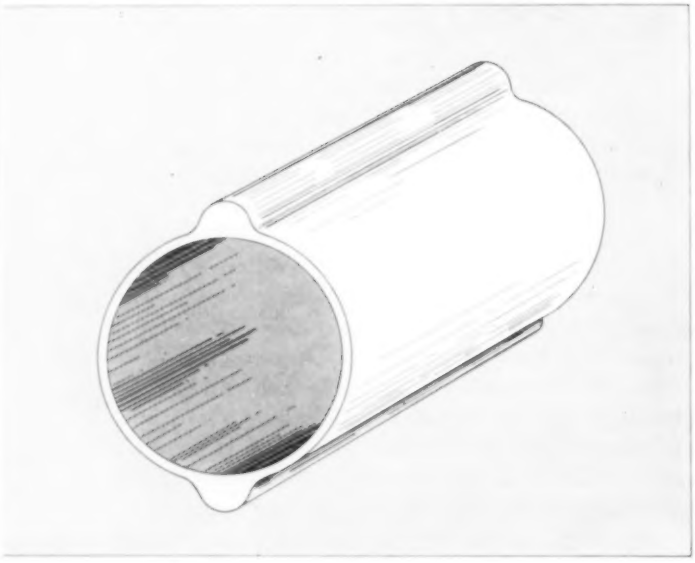
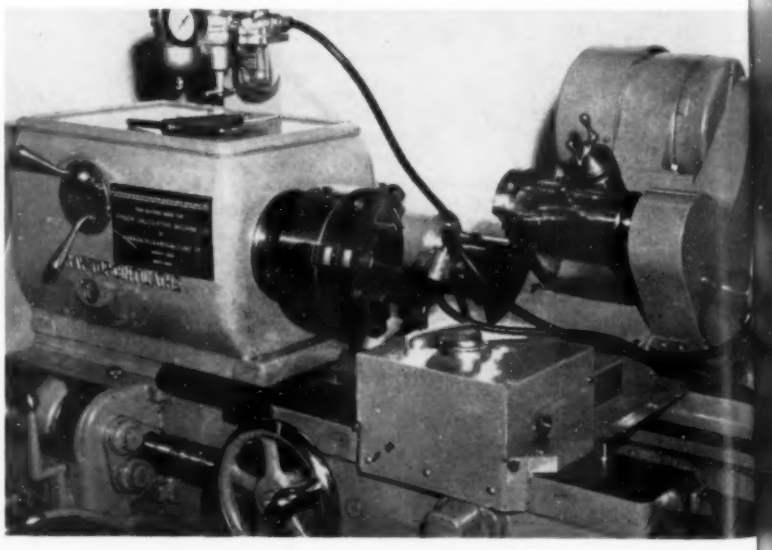


ALUMINUM TUBING, 7 inches long with a 4-inch OD, must be machined along its entire length to result in two-lobe cams as shown. Because of the limited number of parts required, tooling costs had to be minimized. A tracer-controlled lathe could not be used because the single-point tool could not accurately follow the re-entry side of the cam lobes at any speed rate. A crank shaper with a hydraulic tracer attachment could make the part by a series of shaping strokes, with the part indexed after each stroke. This method appeared to be too slow and too expensive.

Short-run production of precise parts is a frequent manufacturing problem. The problem is further complicated when special machines are not economically justified. Such a problem has been successfully solved for machining a two-lobe cam. A standard lathe was converted for this special operation in such a manner that when the special job is completed the machine can be reconverted in three hours without loss of any lathe features.

Minimum requirements for the machine were: a headstock that would rigidly support a work-driving mandrel and revolve accurately at a controlled speed, a milling cutter traveling at high speed and mounted on a movable spindle to permit generation

***Senior member ASTE Golden Gate chapter.**

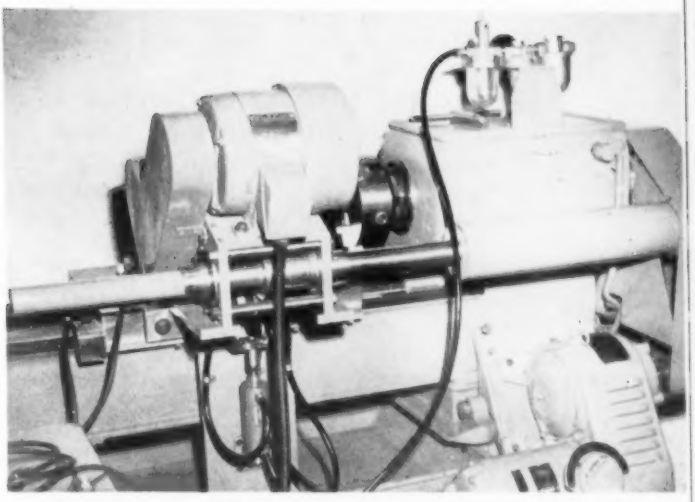


CONTOUR-MILLING ATTACHMENT replaces the cross slide and mounts directly on the carriage of a standard 15 x 54-inch engine lathe having a hardened bed. During actual operation, part is held by an expanding mandrel. The three-jaw chuck shown was used during trial runs. Milling cutter and guard are mounted on left end of the attachment spindle. A dovetail slide carries the milling cutter spindle and the cutter is adjusted in relation to the workpiece by a built-in micrometer. The cutter, designed for this specific job, has 24 carbide-tipped teeth, is 4 inches in diameter, is ⅜ inch wide and has a 4-deg positive rake.

of a cam contour, a carriage to support and feed the milling spindle, and an accurate bed. These requirements could be met by the lathe and milling attachment illustrated.

For increased operating flexibility, the lathe motor was replaced by a variable-speed drive. Through combinations of headstock gears and the variable-speed drive, the main spindle speed can be varied between 4 and 1000 rpm.

Rocking movement of the milling cutter is achieved by cams mounted on a long camshaft. The camshaft acts as a fulcrum for the rocking head. Cooling of the cutter and workpiece is achieved by a mist system normally used with a surface grinder.



BASIC COMPONENT of the machine is a rocker type, spindle carrier, milling attachment with a 1 to 1 ratio of movement between the spindle and an operating cam. The milling cutter is driven by an individual 1-hp motor through V-belts. The cutter operates at about 5000 sfm. The cam is actuated by a hardened and ground spline shaft driven by lathe gears so it is exactly synchronized with the lathe spindle. The milling spindle cam roller is held against the operating cam by an air cylinder. This cylinder has the additional function of raising the spindle carrier clear of the work for the return.

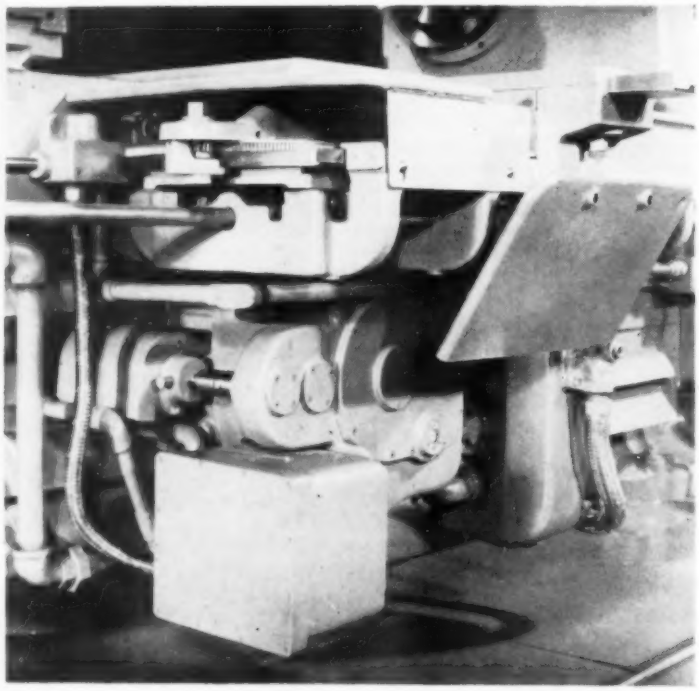
Heavy-Duty Lathe Saves Machining Time

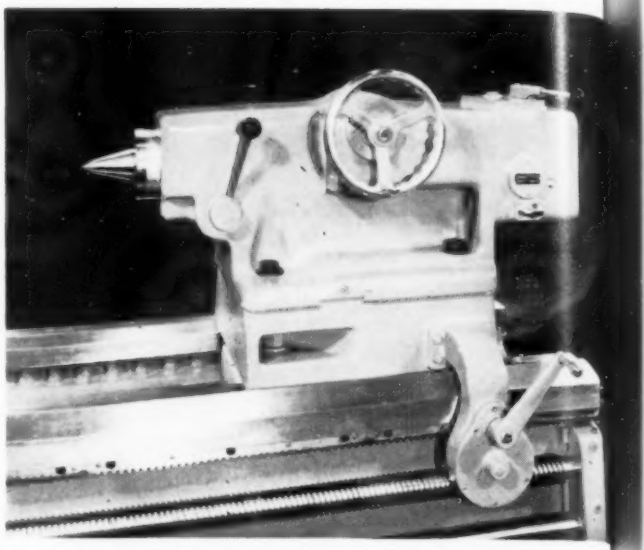
Substantial savings in machining time are anticipated for this lathe because correct spindle speeds are automatically achieved in less than 3 seconds by setting dials to cutting speed and work diameter, and because metal removal rates above 100 cu in per minute are possible. Built by The Monarch Machine Tool Co., Sidney, Ohio, this lathe uses carbide tooling and can take heavy depths of cut with higher than usual surface speeds. Controls are positioned and actuated to minimize operator fatigue.

Work start and stop is controlled by either of two levers, one at the headstock and one at the right side of the apron. The levers have run, brake and jog

HEADSTOCK CONTROLS have been designed for maximum production and flexibility with minimum operator fatigue. Desired surface cutting speed and workpiece diameter are set on two dials. Headstock gears hydraulically shift to give the correct spindle speed. The shift lever has three positions: run, shift and free, for manually turning the spindle. Interlocks provide complete safety. When the lever is moved to shift position, spindle rotation is stopped. Gears cannot shift until the gear train is stopped. If lever is in shift position, work rotation cannot occur. The clutch cannot be engaged while the shift lever is in the free position or the work control lever in the jog position. Jogging cannot be initiated while the spindle is rotating under power or coasting.

positions. Both brake and clutch are hydraulically actuated so that stopping is quick, smooth and shockless. When the lever is in the jog position, the spindle will move slowly until the lever is released.





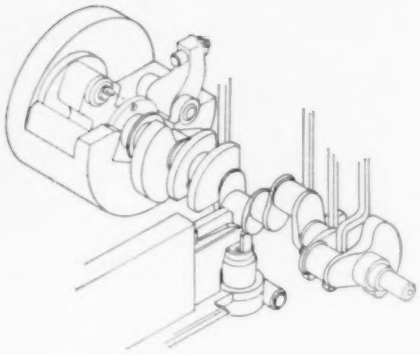
TAILSTOCK DESIGN features convenience in operation and ruggedness. A pawl is mounted on the base for engagement in the backup rack, which is cast integrally with the bed under the tailstock V-way. The pawl is normally engaged but can be disengaged easily. A geared mechanism moves the heavy tailstock along its way. The tailstock spindle has two speeds. Fast speed is used for normal positioning and slow speed is mainly used for heavy drilling operations.

POWERED RAPID TRAVERSE is supplied to give movements in either direction of carriage travel. The motor is mounted on the rear of the carriage and controlled by pushbutton from the apron. Rapid traverse is at 185 ipm and the carriage can be inched under power. Rigidity of the tool support is required for large metal removal rates. The carriage has heavy wings and a ribbed bridge to keep deflection low and vibration absorption high.

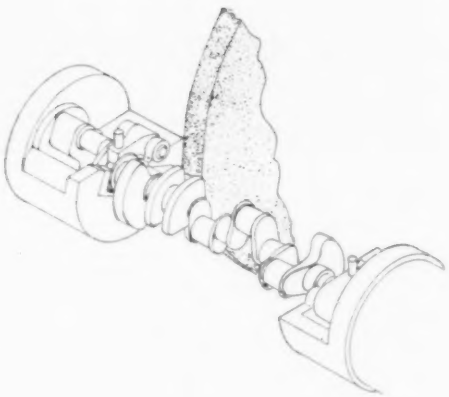
AUTOMATIC CRANKPIN GRINDER controls size by work diameter

One of the first machines developed to precision grind all the pins on an automobile crankshaft in automatic sequence, this transfer type crankpin grinder has four grinding stations. Variable-speed motors drive the grinding wheels and hydraulic motors are used to accurately position the workheads for loading.

Each pair of workheads is driven by a common drive shaft of tubular construction. With the power source equidistant from both heads, torsional errors are avoided in the crankshaft. Unequal movements of the workheads would introduce such errors.

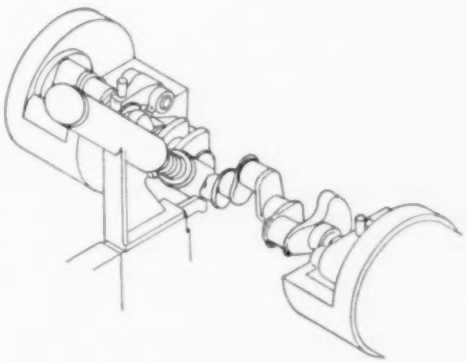


TRANSFER LIFTING HOOKS are supplemented by a locating hook that roughly orients the shaft angularly while it is transported to the next station. At the station, a rotating cam locates the shaft longitudinally in front of the grinding wheel and a locating arm adjusts it to the proper angular position. Final position results from the engagement of a pin in a hole in the crankshaft flange. Forty-two-inch grinding wheels are automatically trued on faces and corner radii after each cycle or periodically as required. Automatic compensation for wheel wear is made by the feeding mechanism. Variable-speed motors drive the wheels at constant peripheral speed.

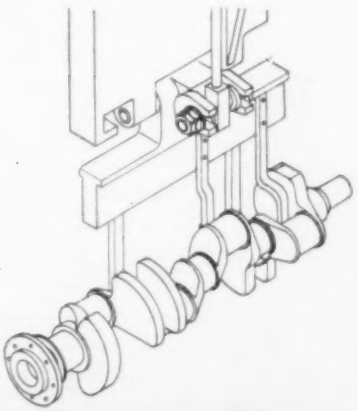


WORK STATIONS are preset to operate at a definite rate of production, about one completely ground V-8 shaft per minute. Any one of the four grinding stations can be cut out while the equipment for that station is serviced. Wheel life is expected to be extended because wheels are automatically trued and because they are mounted between cartridge type bearings on heavy, rigid spindles.

SPARK-OUT and work size are automatically controlled by an electric gage that contacts the workpiece during grinding and automatically terminates the cycle by retracting the wheel slide when specification size is obtained. Lights at each grinding station indicate the progress of grinding. An amber light signifies the gage is operating. Pressure of the gage is set to initiate slow infeed when work approaches size (0.0015 inch oversize) and illuminates the green lamp. When size is reached, the red lamp lights and the slide retracts. Although wheel slide is massive, it can be controlled to produce diameters within tolerances of $\pm$ 0.0002 inch.



FIVE TRANSFER UNITS travel vertically to pick up and deposit crankshafts within the machine. They move vertically simultaneously. The units are joined together and move horizontally to transfer workpieces to successive stations. The first transfer unit picks up crankshafts from a conveyor or loading station; the final unit carries ground crankshafts out of the transfer machine to an unloading point or conveyor.



Welded steel heating coils are blasted clean from the dirty condition, left, in five minutes. Surface of the cleaned coil promotes adhesion of the paint undercoat.

abrasive selection

its importance in blast cleaning metals

By Victor F. Stine
Vice President
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WHILE MANY TYPES, sizes and shapes of abrasives are available, there is usually one that will blast clean a particular part better, faster and more economically than any other. Primary factors to be considered in selecting the correct abrasive for a particular job are: type of metal to be cleaned, shape of part, kind of material to be removed and surface finish desired.

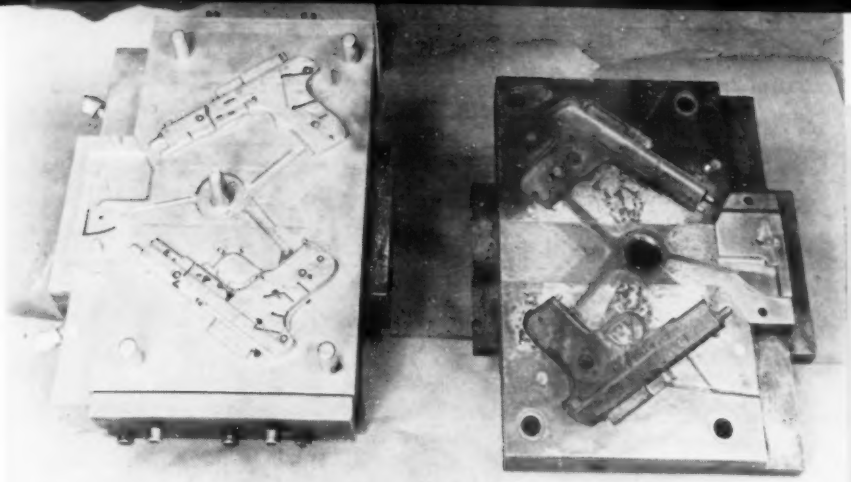
Metals that are cleaned by blasting extend from toughest armor plate and cast iron to soft aluminum alloys and vary in size from locomotives to dental drills. Surface coatings varying from burnt-in sand to thin oil films can be removed by blasts graduated in effects from deep abrading to gentle wiping. To cover this wide range of cleaning requirements, a nearly equally wide assortment of abrasives has been developed.

When choosing an abrasive, the first step is to determine what materials are available and the cleaning characteristics they possess. The second step requires consideration of shapes and sizes of abrasive particles and the effect of particle dimensions on the cleaning action. Third, it is necessary to consider the costs per square foot cleaned. Cost factors are: cost of abrasive, time required, possibility of abrasive recovery and cost of dust suppression.

Abrasive materials fall into four groups: metals,

Table 1—Commonly Used Abrasives*

Metallic	Hardness	Artificial	Hardness	Natural	Hardness	Agricultural
Chilled cast iron	62 R_c	Silicon carbide	9.6 Moh	Garnet	8.0 Moh	Cocoanut shells
Cast steel	47 R_c	Aluminum oxide	9.2 Moh	Quartz	7.0 Moh	Black walnut shells
Malleable cast iron	37 R_c	Glass beads	.....	Silica	7.0 Moh	Pecan shells
Crushed steel	.....	Refractory slag	.....	Decomposed rock (Novacite)	.....	Peach pit shells
Cut steel wire	.....	Rock wool by-products	.....			Filbert shells
Aluminum shot	.....					Cherry pit shells
Brass shot	.....					Almond shells
Copper shot	.....					Apricot pit shells
		*Each group listed in order of decreasing hardness.				Rice hulls
						Ground corncobs



Die at left has been cleaned with an abrasive suspended in a liquid. Such a system cleans without changing dimensions.

chemical compounds, natural compounds and agricultural grits. Hardness, absorbing ability, cutting ability and deterioration tendencies of individual particles are dependent on the materials from which they are formed. The most commonly used abrasives are listed in TABLE 1.

Hard abrasives cut more deeply and more quickly than soft ones. For this reason, chilled cast iron, malleable cast iron and the natural abrasives are used for removing scale and burnt-in sand, and for knocking out cores from iron and steel castings. In spite of the more rapid cleaning possible with hard particles, only those soft enough not to embed in the workpiece should be used. If abrasive particles lodge in the work, they can damage tools during later machining and, in the case of aluminum and brass particles, they can lead to accelerated corrosion in ferrous castings.

Abrasives that are softer than the metal they clean can remove material without substantially changing dimensions. Soft abrasives also reduce blast equipment maintenance. Even though nozzles are made of hard manganese alloy and boron carbide, for example, prolonged flow of hard abrasives will cause wear. Softer abrasives result in much less wear to nozzles.

Agricultural abrasives serve particularly well in removing grease, oil, carbon and similar materials from finished parts and assembled equipment. Because these abrasives are usually residues, they are much less expensive than the petroleum-base solvents that might otherwise be used. The absorbing ability of such particles results in an effect similar to wiping. Various degrees of abrasiveness can be obtained with agricultural grits by mixing different types together.

Blast cleaning equipment that is available also influences the choice of abrasives. Four types of blasting are common and they can be most easily designated by their propellent force medium. They are: compressed air, centrifugal, high-pressure water, and a combination of compressed air and water.

Compressed air equipment can be used with any type of abrasive and the blast pattern is under close control. By varying air pressure or using inductive abrasive flow, the blast intensity can be closely regulated. Compressed air equipment is usually simple in construction and requires little maintenance. This equipment can be used to clean interior surfaces, chambers, holes, etc. The air stream removes spent abrasive from the blasted surface.

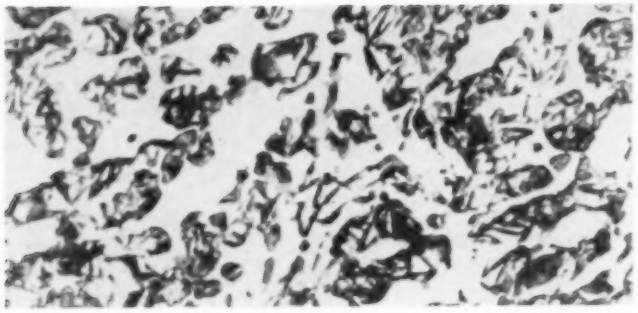
Centrifugal techniques are most efficient with metallic abrasives. Centrifugal equipment requires less horsepower per pound of abrasive delivered. High-pressure water equipment is used with sand as the abrasive. Such machines are used to remove sand cores and clean surfaces in one operation. A further advantage of this process is that it is dustless.

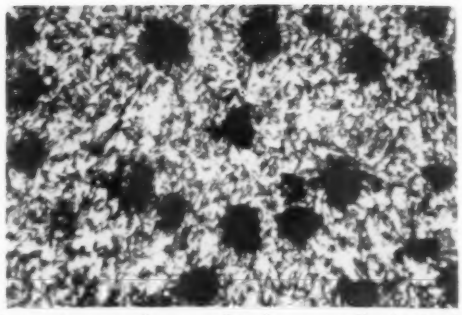
Compressed air and water equipment uses sand or natural abrasives of fine particle size and produces smooth, satin surface finishes. The blast pattern is under close control and the operation does not produce dust.

Hydraulic equipment, which cleans by spraying the surface with abrasives suspended in water, uses aluminum oxide, quartz, silicon carbide, silica and natural abrasives up to 5000 mesh. Agricultural abrasives, in most instances require compressed air blasters because individual particles are light. Chilled cast iron or sand is used on difficult jobs with air blasters while malleable abrasives are used for

Table 2—Screen Apertures and Standard Screen Numbers

Screen Aperture (inch)	Grit Screen (number)	Shot Screen (number)
0.132	.....	S-1320
0.0787	G-10	S-780
0.0394	G-18	.....
0.0331	.....	S-330
0.0165	G-40	S-170
0.0070	G-80	S-70
0.0049	G-120	.....
0.0017	G-325	.....





Photomicrograph at left shows microstructure of ordinary tempered shot at magnification of 1000X. White matrix shows presence of brittle cementite which leads to low resistance to breaking under impact. Photomicrograph at right shows malleableized structure at magnification of 500X. Dark areas are graphite nodules and brittleness is avoided with only slight reduction in hardness.

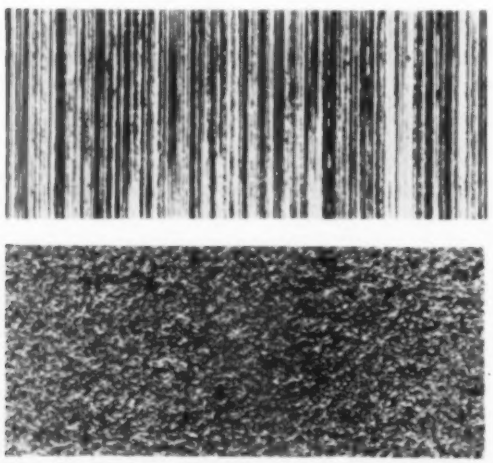
lighter cleaning where surface finish is important.

Most metallic abrasive particles are classified either as shot or grit. Shot is as nearly spherical as manufacturing economy will allow while grit is irregular and has many cutting edges. A few abrasives, such as cylindrical cut wire and cubic hardwood particles do not fall into either classification.

Shot results in a peening action. It hammers the metal, cracking and lifting the material to be removed. Grit both hammers and cuts the surface it is cleaning. Because of the difference in cleaning action, grit and shot are used for different applications. Basically, shot is used to remove foundry sand while grit is used for removing paint and rust, and for preparing surfaces for further finishing.

Shape of the work to be cleaned is an important factor in determining abrasive size. Because large shot ricochets when it strikes a surface, it is particularly useful in cleaning intricate pieces. Large shot bounces to hard-to-reach surfaces and does multiple cleaning before its energy is expended.

Section thicknesses of the part being cleaned limit the size of abrasive that can be used. Because larger particles are usually heavier, they develop greater kinetic energy, strike the surface with greater force and peen the surface more vigorously. Heavy peening is desirable in many cases but, if the sections are thin, the surface exposed to the blasting might stretch and cause warping.



Photomicrographs comparing No. 4 ground (20 to 23 microinches, rms) surface with same surface after Hydro-Finishing with No. 1250 abrasive in liquid. Magnification, 125X.

Size of the abrasive particles governs the coverage provided by the bombarding stream. Small particles give more uniform coverage with more overlapping and less chance for missing a portion of the surface. Particle dimensions also affect the surface finish produced by blast cleaning. Small particles produce fine finishes; large particles produce coarse finishes. Shot results in a smooth, minutely dented surface and grit forms a rough surface covered with small, irregular cuts.

Because of the irregular shape of grit, it is difficult to specify size. ASTM has devised a system for measuring sizes of both grit and shot based on passing a sample through a series of screens with diminishing mesh sizes. Three screen sizes—high screen limit, low screen limit and nominal screen—indicate the size of the particles.

The high screen limit is a measure of the smallest screen that is too large to retain any of the sample. The low screen limit is a measure of the largest screen that is too small to pass more than a given percentage of a sample. Percentages range from 5 to 25 percent for shot and 10 to 35 percent for grit. The nominal screen is the largest that will retain a large percentage of the sample—85 to 65 percent for shot and 80 to 20 percent for grit.

Abrasive size is usually designated by the size of the aperture of the nominal screen. Screen numbers have been assigned arbitrarily to aperture sizes to simplify nomenclature. An "S" prefix indicates a shot screen size and a "G" prefix indicates a grit screen size. For example, G-18 indicates a grit a specified percentage of which will remain on a number 18 screen or, referring to TABLE 2, a screen with an aperture of 0.0394 inch. Similarly, S-330 designates a shot whose sample has a nominal screen aperture of 0.0331 inch.

More than half of the blast cleaning abrasives consumed each year are used to clean sand and

Table 3—Abrasive Sizes for Removal of Sand and Scale from Ferrous Castings

Type of Abrasive	Workpiece Material		
	Cast Iron	Malleable Iron	Steel
Shot	S-550 to S-230	S-550 to S-330	S-660 to S-390
Grit	G-16 to G-40	G-18 to G-40	G-14 to G-25

Table 4—Abrasive Sizes for Scale Removal from Steel Sheets and Plates

Steel Thickness (inch)	Abrasive Size (screen number)
0.25 — 0.1093	G-40 to G-50
0.1093 — 0.05	G-80 and finer
0.05 and finer	Liquid media

scale from ferrous castings. TABLE 3 lists the abrasives most commonly used for such cleaning. Differences in choice represented in the table arise from differences in shapes of parts being cleaned, surface finish requirements and equipment available.

The most effective abrasive that will not cause warping should be used to clean steel sheets and plates. Abrasive sizes recommended for various plate thicknesses are listed in TABLE 4. Armor plate, which is hard, heavy and usually covered with thick scale, requires G-14 to G-25 abrasive. Since hard metal grits are required to dig under tenacious weld splatter on castings, and because fine finishes and uniform coverage of the work are usually desired, abrasive sizes G-25 to G-40 are usually used.

Rust and other corrosion products have a wide degree of tenacity and may require different types of abrasives for removal. Metal or sand abrasives are usually used but, for the less tenacious corrosion products, corncobs, wood particles and other agricultural grits are sufficiently abrasive. Sizes used for such applications range from G-18 to G-50. When removing paint prior to repainting it should be borne in mind that a smooth surface with good "tooth" is desired. This means that less paint will be required and that which is applied will adhere. G-40 to G-50 abrasives are used.

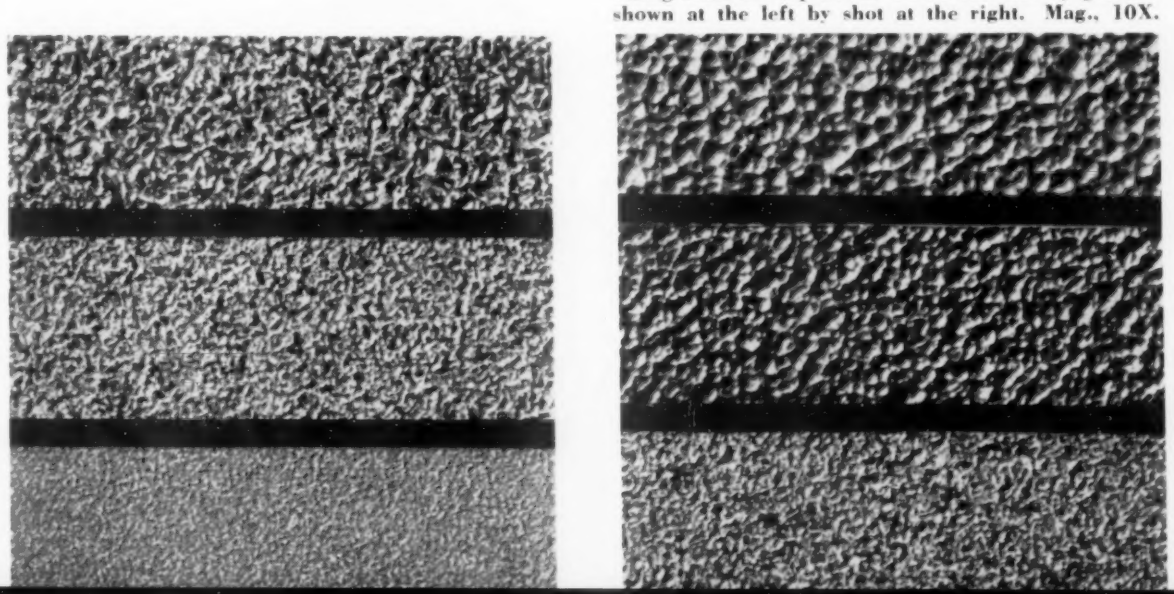
Surface cleaning prior to the application of finishes is generally governed by the thickness of the finish to be applied. Thick finishes require coarse cleaning to provide adequate tooth. Grit sizes G-18 to G-40, depending on the type of finish, satisfy most requirements.

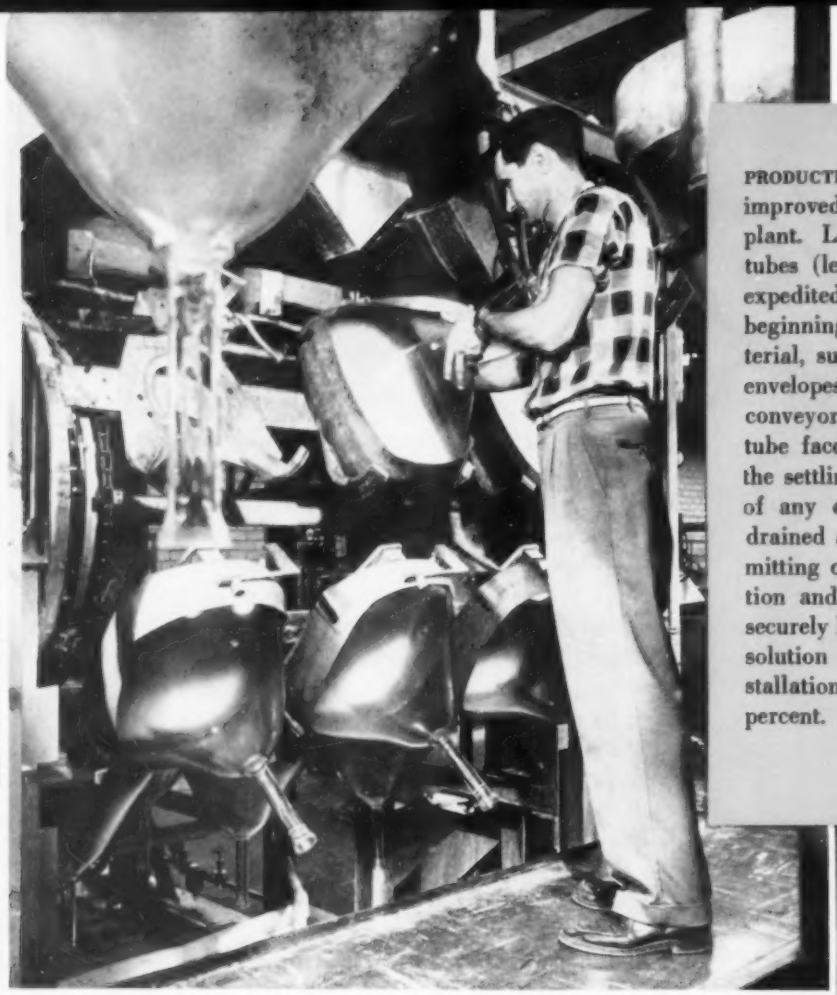
Free carbon left on surfaces that are to be enameled can cause the finished surface to blister, bubble or lift. Free carbon can be removed before enameling by passing the work over fuming nitric acid or by using a small percentage of foundry sand with the blast abrasive. A good way to avoid free carbon problems is to use malleable abrasives that contain carbon only in combined form.

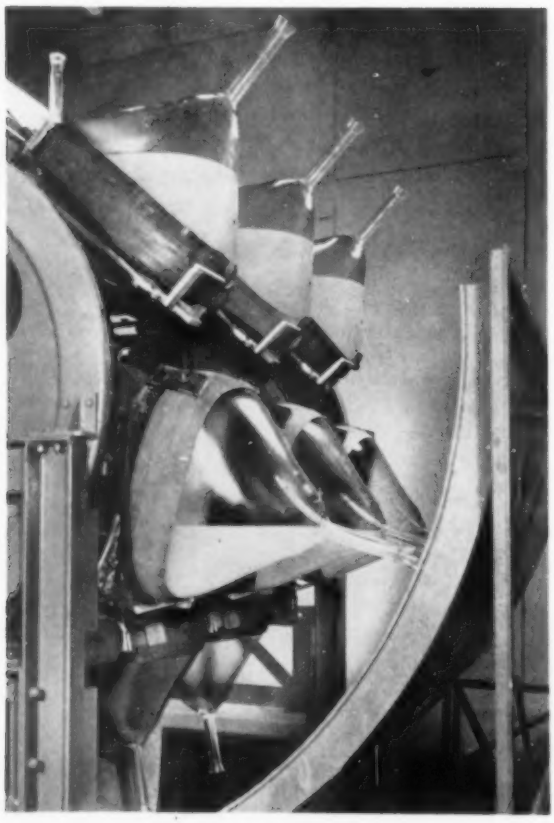
When cleaning nonferrous castings, care must be taken to avoid embedding abrasive particles in the metal. For brass, bronze and magnesium castings, G-50 malleableized abrasive is recommended because of its softness and burnishing action. If shot is used, S-170 is recommended with malleableized types preferred.

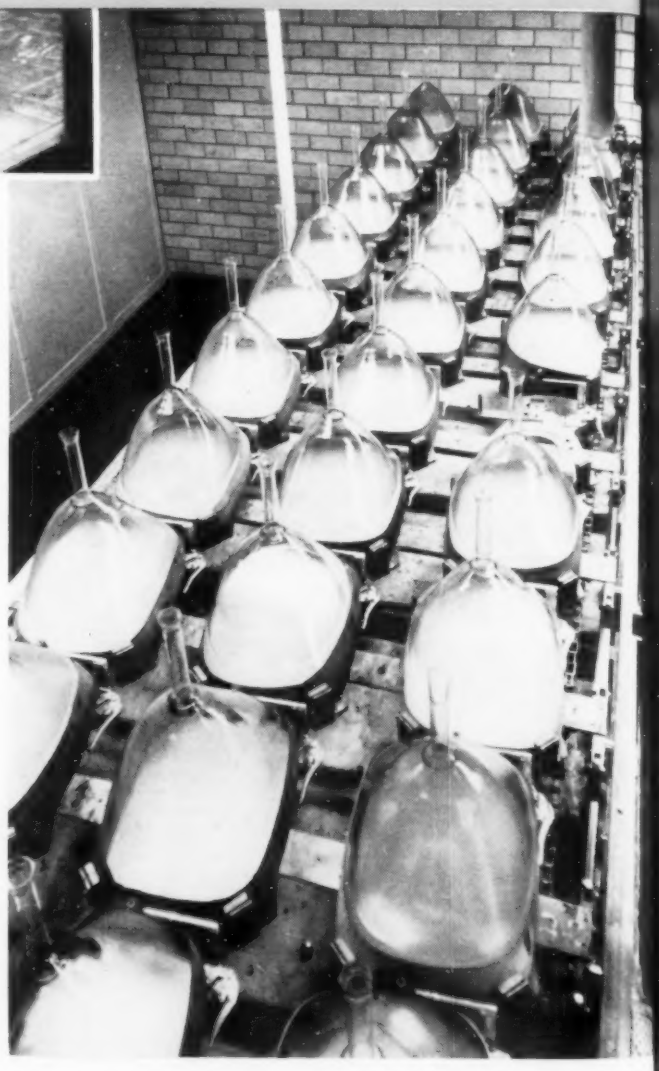
Many blast cleaning jobs represent special applications and proper abrasives can be selected only after experiment and study of the problem. Aluminum rolls for drying cellophane, for example, are cleaned by S-230 to S-460 cast steel shot so the surface will be roughened to provide traction for the film web. Railway car wheels and axles are cleaned in preparation for magnafluxing by blasting with G-80 chilled cast iron grit.

Typical blasted surfaces with size of abrasive diminishing from the top down. Surfaces made by grit are shown at the left by shot at the right. Mag., 10X.









PRODUCTION OF TV TUBES has been stepped up by an improved holding fixture at the RCA Marion, Ind. plant. Loading and unloading the fragile picture tubes (left) for coating the interior face has been expedited by a new clamping arrangement. At the beginning of the critical operation the coating material, suspended in water, is poured into the tube envelopes. As they progress along the slowly moving conveyor belt (below rt.) the material settles on the tube face in a uniformly distributed film. During the settling and drying cycle the belt must be free of any disturbing movement. Excess solution is drained at end of the conveyor (below left). Permitting continuous operation by eliminating vibration and jarring during loading, the clamps also securely hold the inverted tubes while excess coating solution is drained. Compact design allowed installation of more fixtures, raising output 15 to 20 percent.

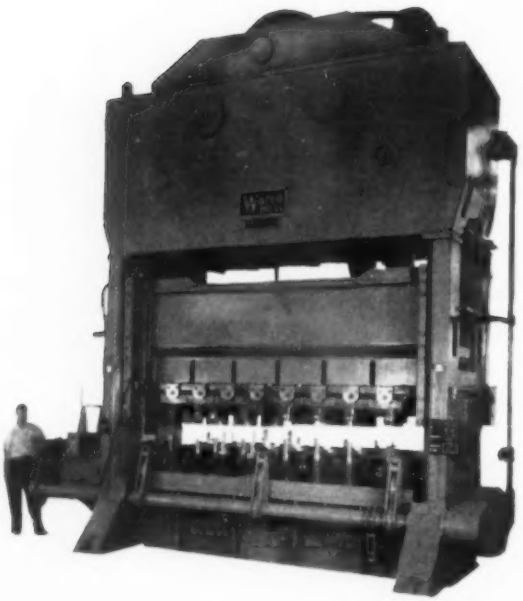
—Photos courtesy Lapeer Manufacturing Co.

TOOLS at work

FINISH GRINDING of one circular and four square slots in locator part is being performed on a jig borer with a grinding attachment. The part is held on a permanent magnetic chuck mounted on a rotary table operated at a speed of 80 rpm. Grinding spindle speed is 60,000 rpm. Accuracy of the operation is held to plus or minus 0.0002 inch. ***—Photo courtesy Vulcan Tool Co., Dayton, O.***

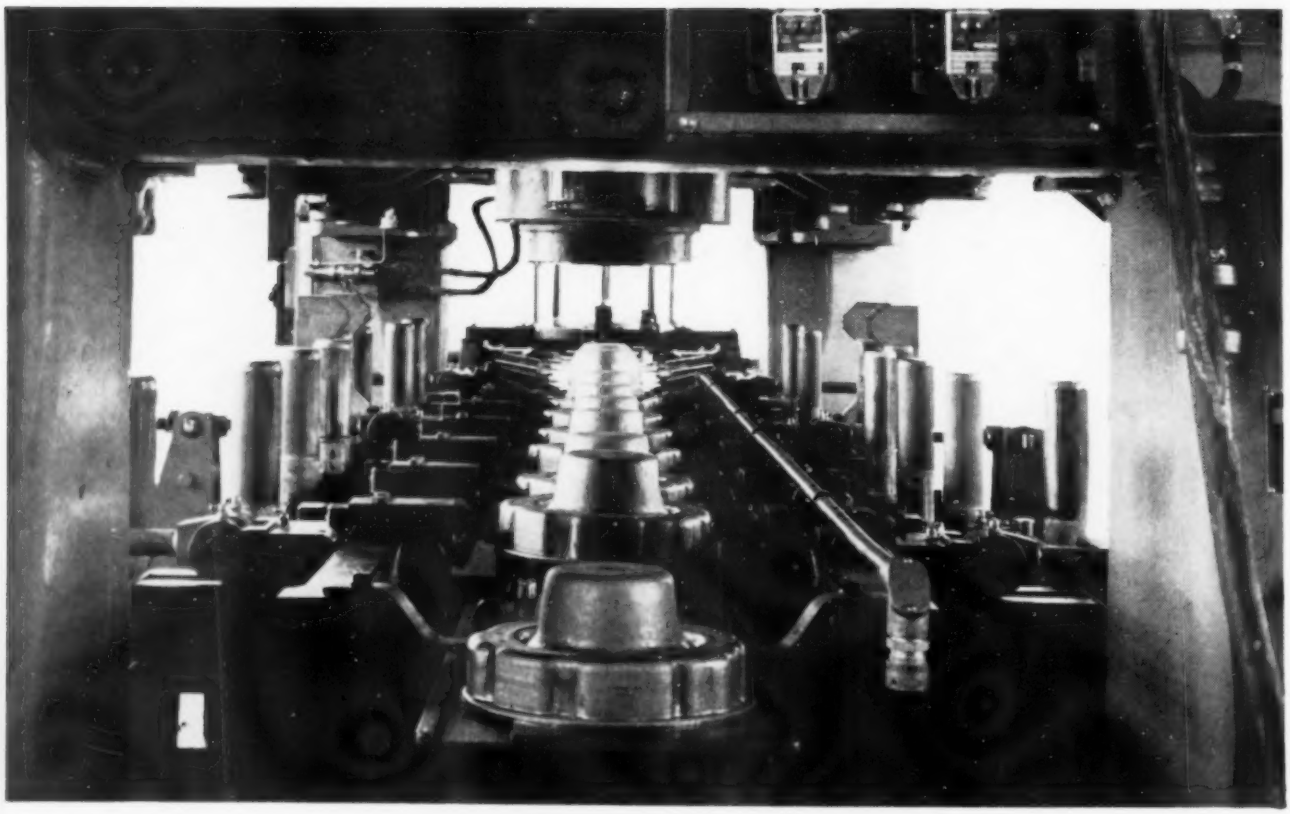
SPECIAL GRINDING OPERATION on alloy steel created an unusual problem in the GE Research Laboratory. The temperature had to be kept low to insure reliable readings on the strain gages mounted on the workpiece, which was heat treated to 60 R_c. A simple solution was found by using chips of dry ice to dissipate the heat of grinding. The gages were used to measure bending due to released residual stress after the cut was made.

TOOLS at work



AUTOMATIC TRANSFER feed press utilizes 8 of 14 stations for high production of aluminum sealed beam headlight housings. The blank stack (left side of top photo) is loaded from top so that the operation can proceed without interruption. (Closeup) The first station is under the stack where blanks are pulled from bottom by a suction cup, past a series of small hardened bits which hold the stack and separate blanks. The second station is for detecting double blanks. An idle station precedes the oiling and flattening station. The next three stations perform drawing operations and are followed by a restrike. Then pierce, trim, edging and finally a cam piercing operation complete the part. It is then carried through an idle station and discharged. Scrap and slugs drop through bed openings for discharge from front and rear of the press.

—Photos courtesy The Federal Machine & Welder Co.



shell molding equipment and its use

By Otto W. Winter*

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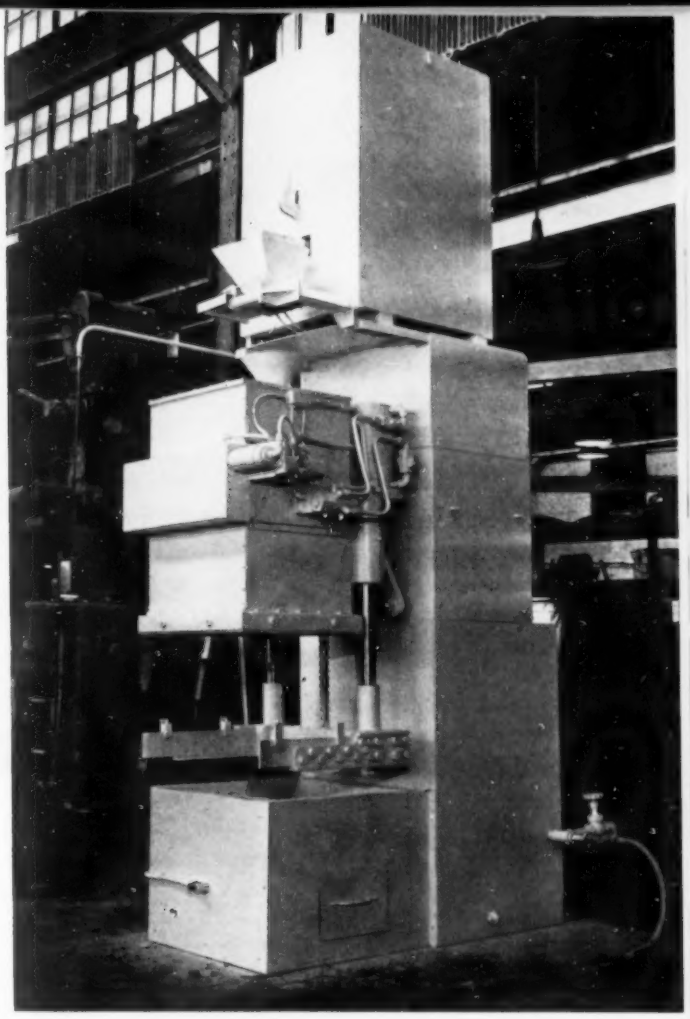


Fig. 1. Vertical rainfall inversion investment machine with vibratory feeder. A redistributing device in the sandbox insures a level layer of mixture over the pattern.

TOOL ENGINEERING was not fully applied to shell molding equipment until many months after shell molding had been introduced to the foundry. It has been only recently that the advantages of careful tool engineering have been realized. With this progress, control has become a vital component of shell molding equipment. The introduction of control and precision has made possible a full realization of the mechanization potential of the process. The inversion unit pictured in *Fig.* 1 is typical of well-designed modern molding equipment.

Mold Making

Sand-resin mixtures could be applied to patterns manually but the dump box was quickly adopted as an improvement. Because of its operation, however, the plain dump box does not provide uniform shell density. With either manual or mechanized operation, the sand-resin mixture slides across the face of the pattern causing soft spots or voids on the side of the pattern away from the flow, *Fig.* 2. The sand is loosely or poorly packed in these soft spots, which can lead to sand burn-in and metal breakout. Only relatively flat pieces can be produced properly with plain dump box investment because this condition becomes more serious with increased pattern height.

The most modern approach to mold making comprises the shell blowing system. Shell blowing, with proper blow and vent holes, will prevent packing problems and permits production of shells with any types of protuberances. In many instances, inversion investment equipment offers the simplest and most practical solution to packing problems. However, since the sand-resin mixture cannot be dropped as a mass without entrapping air or arching, which causes soft spots or voids, inversion investment equipment must contain some means for producing a rainfall type drop.

The inversion investment unit shown in *Fig.* 1 is equipped with a series of power-operated shutters that break up the vertical fall from the storage section of the sandbox. The sand-resin mixture streams through the drop section onto the pattern in a rain-

*Life member ASTE Buffalo chapter.

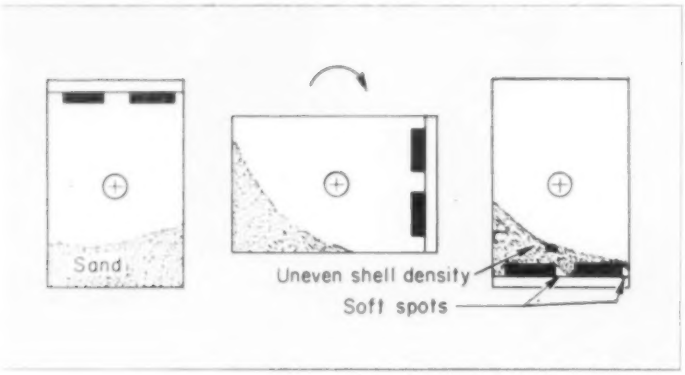


Fig. 2. Undesirable dump box mixture action. Shell is soft and porous at the bottom of the slope because the weight of the overburden is insufficient to cause proper packing.

fall pattern that correctly builds the investment from the bottom of the pattern upward.

With dump box procedures, it is necessary to refill the box frequently to maintain consistency in the mass of sand-resin mixture striking the pattern. If this is not done, shells will become progressively softer and more porous. For example, a 24 x 30 x $\frac{1}{4}$-inch shell weighs approximately 10 lb and each time a shell is molded the overburden weight is reduced by this amount. To insure uniformity, an amount of mixture equal to that used in each shell should be added in each investment cycle. In dump box equipment, such addition can only be accomplished manually and with some difficulty.

With a modern inversion investment unit, this process is handled automatically. The storage hopper delivers to the sandbox a metered amount of mixture at the end of each investment cycle equal to the amount consumed in making the shell. Delivery of the mixture is accomplished by a vibrating feeder that can be adjusted easily for any desired volume. The storage hopper is reloaded occasionally by a hoist and bucket or by a conveyor, or in the case of resin-coated sand, by a cyclone and sand blowing system that is usually part of the sand coating equipment. Manual reloading of any sandbox should not be necessary.

On inversion investment shell mold machines, the sandbox should be completely sealed to prevent escape of dust during the investment drop. Also, the opening of the sandbox should be water cooled to prevent increase in temperature and subsequent build-up of cured resin. Caked resin, when heavy enough, will fall onto and spoil a mold. Temperatures in the sandbox can increase to the point where polymerization starts in the storage section if the opening is not cooled.

Occasionally a shell will peel and drop from the pattern during inversion. This can be caused by excess parting solution, wrong resin conditions, improper mixing, inadequate pattern temperature, etc. Whatever the cause, an inversion sandbox should have a screen to catch dropped shell portions to prevent contamination of the sand-resin mixture in the storage section of the box. It is desirable that the inversion investment cycle end with the pattern face up to minimize any tendency for shells to drop off.

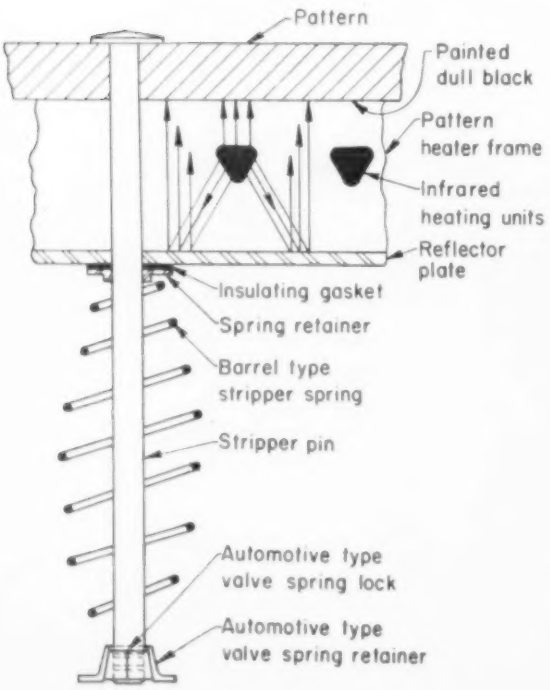
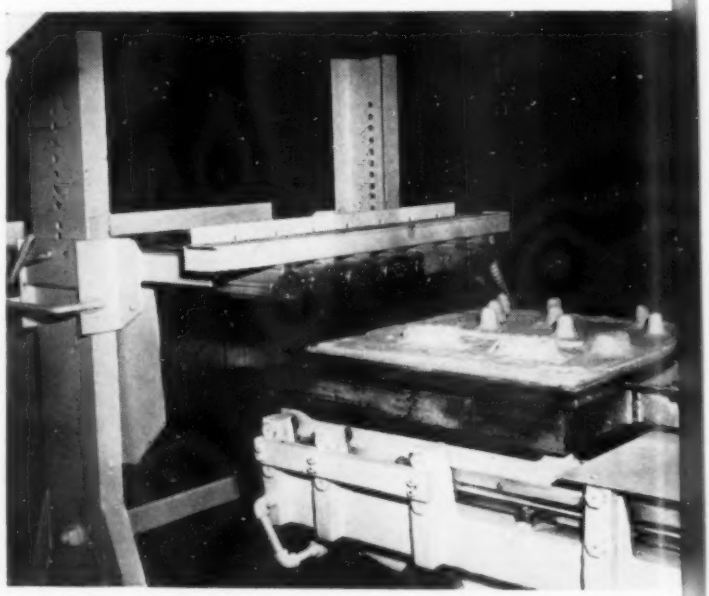


Fig. 3. (left) Effective heating of patterns can be accomplished by using radiant elements in a frame. Control of the elements is through a thermoswitch located in the pattern.

Fig. 4. (below) Invested shell ready to enter infrared shell curing furnace. Pattern heater is also visible.



Also, the stop in the inverted position should be cushioned by a brake.

The problem of uniform mass is bypassed with shell blowing. Only sufficient sand-resin mixture to fill the cavity between the pattern and contour plate is blown into the box. Enough mixture is kept in the magazine to fill the mold cavity at each blow.

Weight alone is not sufficient to produce the desired packing of the sand mixture during formation of a shell mold. In inversion investment, desired packing is achieved by dropping the mixture from sufficient height to insure build-up of the desired density. Free falls of 12 inches or less are ineffectual.

In shell or core blowing, proper packing is realized through the impact of blown particles and a squeeze effect from air pressure. It is necessary, however, to be sure that air pockets, turbulence and channeling are avoided by properly locating and sizing blow and vent holes.

Pattern Temperature

In both shell molding and blowing, since the resin is in intimate contact with the hot metal pattern during investment and subsequent curing, it is necessary to control pattern heat output by control of its temperature. Excessive pattern temperature, above 550 F, can cause overpolymerization of the resin. Shell thickness is primarily controlled by pattern temperature because of the insulating property of sand.

Control of shell thickness is vital and represents one of the major controls in the shell molding process. Excessive thickness wastes resin and sand, and may cause serious loss of mold porosity. Also, a thick shell may be difficult to cure properly. Shells that are too thin may warp excessively after stripping or may crush and break during pouring. Once a shell thickness is established for a given job, it should be consistently maintained. This requires a constant pattern temperature at each investment.

Use of a pattern reheating operation in the cycle is uneconomical. Borrowing of pattern heat from the curing furnace during the cure is not dependable. Such a method requires constant checking of pattern temperature, which is affected by any delays in the operating cycle. Furthermore, such a procedure inevitably overheats the stripper pin springs or push-pull plate.

Electric heating elements with thermostatic temperature control can overcome these disadvantages. Elements can be cast integrally in the pattern for maximum thermal efficiency. However, if such an element burns out, it usually cannot be replaced without damage to the pattern. Heater elements must be located carefully to avoid hot spots, nonuniformity and interference with stripper pins. Heater elements fastened to the back of the pattern facilitate replacement but at reduced thermal efficiency. This also increases pattern cost.

A successful, efficient and flexible method of heating patterns is illustrated in *Fig.* 3. It consists of a rigid frame on which the pattern is mounted and across which are set a series of electric radiant heater elements. Below the elements is an aluminum coated steel reflector plate. Heat that does not radiate directly to the underside of the pattern is reflected to it by the reflector plate. The underside of the pattern is painted a dull black to increase heat absorption.

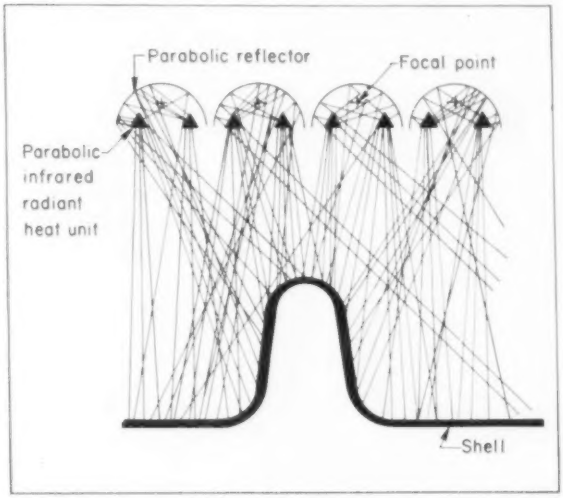


Fig. 5. Electric radiant heat shell curing furnace that enables heat rays to be directed to base of shell plus sides and tops of protuberances. This sketch indicates the action of the furnace shown in *Fig.* 4.

Elements are set about 2 inches apart to provide room for stripper pins but can easily be shifted if necessary. Elements do not touch the underside of the pattern. They are several inches from it to allow for patterns with irregular parting lines. Such a heating frame provides uniform and consistent pattern temperature regardless of cure time because it is controlled by a thermoswitch inserted in the pattern.

Where patterns have tall, thin projections that can hold only a small quantity of heat at a given temperature and heat flow from beneath would result in a prohibitively slow cycle, a furnace reheat is used. If a furnace is interposed between stripping and investing, production time is not lost.

Multiple pattern machines should have completely independent temperature controls for each pattern so that shells of any desired thickness can be produced on any pattern. This retains the flexibility of a single pattern machine but with the productivity and economy of multipattern equipment.

In shell blowing, pattern temperature control is important since pattern heat is a contributing factor to the over-all curing cycle of the shell. The only

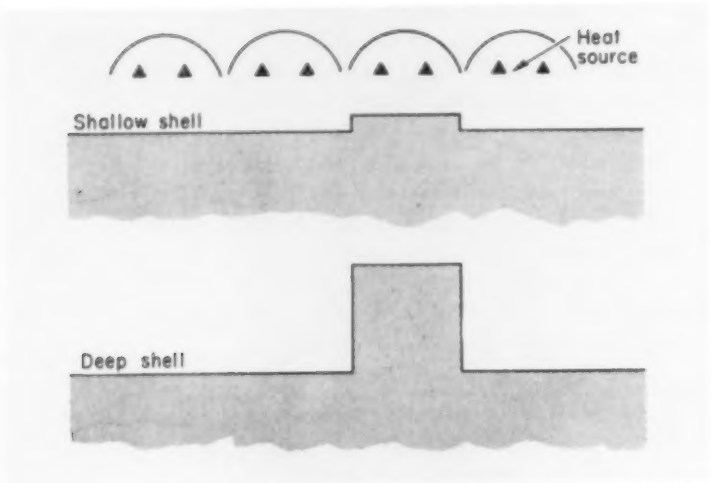


Fig. 6. Uniform cures are achieved with shallow shells close to the source and deep shells further away. Heat output must be increased as distance increases if the same cure time is desired.

difference is that shell thickness is determined by the physical dimensions of the cavity.

Investment Time

Although pattern temperature is of prime importance because of the insulating effect of sand, accurate investment time control is also important to the production of consistently accurate and uniform shells. Shell thickness, in inversion investment, is actually a function of time and temperature. This determines to what depth the resin will melt.

In shell blowing, investment melt time can often be reduced to a minimum, particularly if the pattern is relatively flat. However, heat absorbed from the hot pattern is an important part of the shell curing cycle. This portion of the cure determines the degree of polymerization on the mold surface, which surface is contacted by the poured metal and determines surface character of the cast part.

Shell Curing

Experience has indicated that independent control of the cure of the two sides of a shell is desirable. Many jobs have been successfully completed by a thorough cure or "fry" from the pattern side and semicure from the "broil" or furnace side. Such a procedure sets up the mold face detail accurately with full polymerization but leaves the back of the shell only partially polymerized. Heat of the molten metal, on casting, can complete the polymerization and delay mold deterioration until solidification is reached or at least further progressed. Resiliency thus imparted to the back of the mold minimizes the likelihood of "glass cracking" from the thermal shock of the molten metal mass.

As with control of the pattern temperature, control of curing time and temperature is important for mold uniformity. Overcuring causes weak shells that will burst under the hydrostatic force of the molten metal during pouring. Undercuring, especially on the pattern side, can cause a prohibitive amount of gas. Also, undercuring results in limp shells that cannot hold shape.

Radiant heat offers a number of desirable features for curing shell molds. It can be controlled to provide any desired amount of heat output and it can be applied in a sharply defined pattern without waste or spillage. Because of the open construction possible in radiant heat furnaces, *Fig.* 4, smoke and fumes from the curing shells are easily disposed of without loss of heat.

Since radiant heat is directional and can be controlled, sides and tops of protuberances can be uniformly cured as well as the base shell. Radiant heat elements can be arranged away from the focal point of the parabolic reflectors, *Fig.* 5, so that both angular and vertical rays of heat are provided. Such heating elements transmit heat rays largely in the far infrared wavelengths, which are particularly penetrating when heating sand.

Radiant heat gas furnaces use ceramic burners in which about 90 percent of the thermal energy delivered is available as radiant heat. Rays from such sources are multidirectional and disperse well over

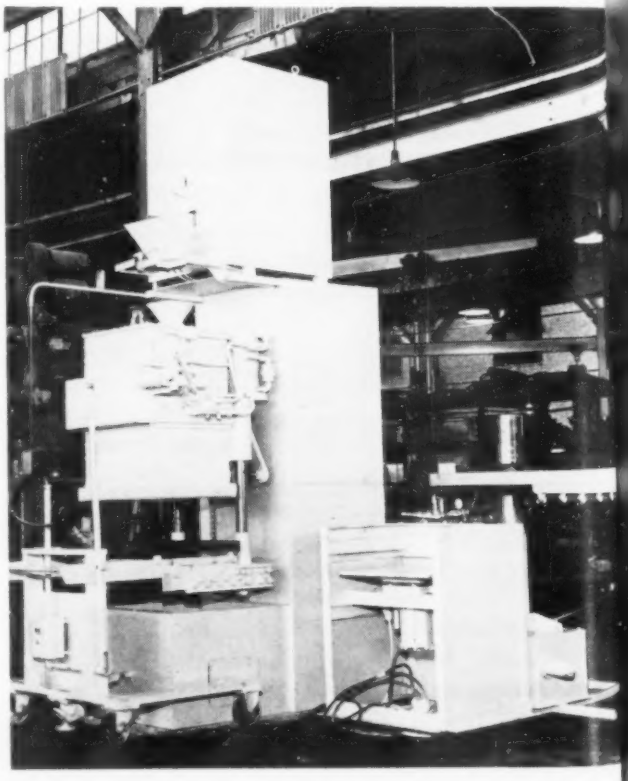


Fig. 7. Two-station single-pattern dolly-transfer type shell mold making machine built around the basic inversion unit shown in *Fig.* 1.

the shell, including the tops and sides of protuberances. Some convection is also induced, which is useful during the cure of extremely high pattern protuberances.

Because radiant heat energy varies inversely as the square of the distance from the source, varying the distance from furnace to curing shell, as illustrated in *Fig.* 6, produces a flattening effect on the heating pattern. Furnaces having vertical adjustments can provide a uniform cure for the base shell and protuberances, regardless of the height of the protuberances. As the distance between furnace and pattern is increased, heat output can be stepped up to maintain production rate.

Pattern Stripping

There are a number of desirable precautions that should be taken when stripping the finished, cured shell from the pattern. Flat shells should be produced if these precautions are met. Flatness is necessary if fins are to be avoided at the parting line and if dimensional tolerances are to be held.

It is essential that stripper pins move simultaneously. Otherwise, warping or breaking of the shell may occur, or the pins might push through the shell. Ample pressure must be provided to permit a smooth draw. The amount of pressure required depends on the pattern area, amount of draft, smoothness of pattern surface, amount of release agent used, degree of pattern break-in, etc. Allowable speed of draw varies with the difficulty of the draw. Speed should be reduced for difficult draws.

Stripper pin stroke should be ample to clear the shell from the highest point of the pattern. This makes shell removal easier and permits automatic shell removal. If the operator must draw the shell from the pattern, there is an element of human error introduced and risk of damage or warping is increased. The operator should merely pick up the shell and remove it from the stripper pins.

It is desirable for the stripper pins to remain in the elevated position for a timed period to permit the shell to cool and set before it is handled. Having the pins remain raised for a period of time also facilitates cleaning under the heads of mushroom type pins.

Either mushroom type stripper pins with individual springs or flush type push-pull pins can be used. Flush pins lack the flexibility of the mushroom type because a push-pull pin plate must be provided for each pattern. Flush type stripper pins can be grouped closely together because there are no springs to interfere and they have no heads under which sand can catch. Mushroom type pins, however, can be made in a variety of head shapes to facilitate difficult stripping conditions.

Location of stripping pins varies with the job but, generally speaking, they should be placed as close to difficult draw areas as possible, distributed over the entire pattern face and in as large numbers as practical.

Properly designed heaters and curing furnaces do not heat stripper pin springs. Where excessive spring heating cannot be avoided, tool steel or other high alloy springs must be used and maintenance costs will be high. Excessive heating of push-pull plates must be avoided because they will warp and result in uneven stripping.

Adjustability and Setup

A prerequisite of any well designed mold making machine is ease of adjustment. The process requires exact control of time, temperature, sand-resin additions, etc. It should be possible to make these adjustments with direct-reading stepless indicating-controlling instruments so that any desired mold making cycle can be easily established and consistently repeated.

Pattern changes should also be easily and quickly made. Optimum pattern change occurs when one pattern assembly is picked up and another is dropped into its place on the machine. One way of accomplishing this is shown in *Figs.* 3 and 4 where the pattern is bolted to a pattern carrying and heating frame. This assembly, with stripper pins and springs, is made at a bench and the pattern is brought up to operating temperature while the machine works the current job. Pattern replacement then just consists of unplugging and picking up one assembly and putting the prepared one in its place. Machine down time is at a minimum since the entire change can be made in a minute.

Fig. 8. Three-station, three-pattern automatic rotary-indexing shell mold making machine.

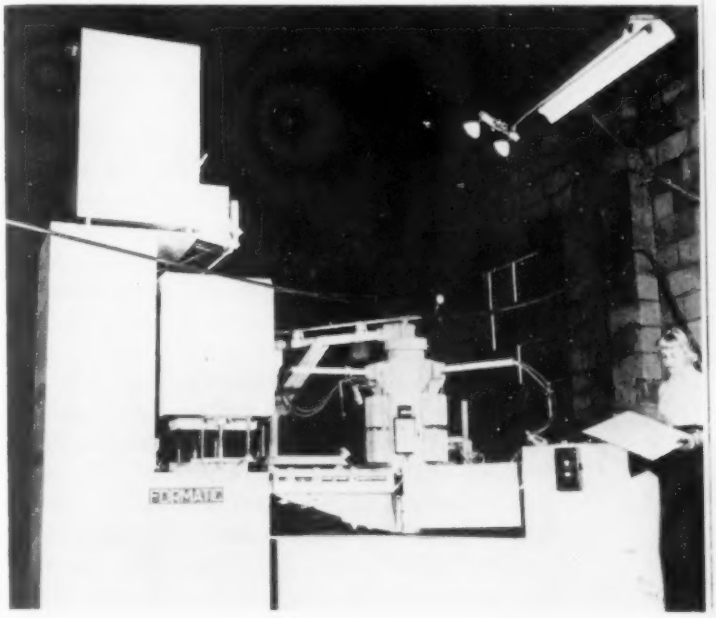


Fig. 9 Different job can be handled at each end of this duplex, shuttle shell blowing machine.

Planning for Production

Most shell mold operations start with modest installations. As production increases, it should be possible to enlarge facilities without scrapping the original equipment. This is possible with mold making machines that are built up of a combination of unit packages.

The first unit is the inversion investment equipment, such as shown in *Fig.* 1. The second unit is a curing furnace. A shell stripper mechanism constitutes the third unit. Where patterns, pattern heaters, stripper pins and springs comprise an assembly it is actually a fourth functional unit.

These units can be arranged in a variety of ways, i.e., in-line with transfer dolly or shuttle arrangement, as in *Fig.* 7, or in a circle with the patterns transferred from function-to-function on a rotary indexing unit. The rotary index is the most efficient because the operator stands at one position, the stripping station, but can control several patterns simultaneously.

Productivity of rotary index machines, *Fig.* 8, is primarily a function of the number of patterns used. Based on a 30-sec cure, a single-pattern machine would produce about a shell a minute. This would be a complete mold if the shell were waffled (split in half). If the shell were booked with another one, one shell would comprise half a mold but of twice the size.

A two-pattern machine, on the same basis, would produce 1½ shells per minute and a three-pattern machine would produce 2 shells per minute. Thus, on a three-pattern, three-station machine, *Fig.* 8, the capital investment is being fully utilized at all times because of simultaneous operation of all stations or functions. On a single-pattern machine of any type, two-thirds of the investment is idle at all times.

With the addition of a fourth pattern and a second furnace, curing time can be split in half with a resulting production of three to four shells per minute. Investment time would then be the limiting factor. A multiple-pattern rotary-index machine can have all the productivity of an equivalent number of single-pattern machines with no sacrifice in flexibility, with a fraction of the capital investment and with just one operator.

For a shell-blowing machine, the inversion investment unit is simply replaced by a blowing unit. Because of the lower investment time for shell blowing, a four-pattern double furnace machine would easily produce four shells per minute. It is possible to start a shell molding program with an inexpensive single-pattern machine and add additional patterns, furnaces and automatic features as production requirements warrant.

Shell Blowing

Selection between inversion investment and shell mold blowing is primarily based on the economics of pattern amortization and production flexibility. High production will generally warrant shell mold blowing; moderate production may not.

A shell mold blowing machine of the double-end shuttle type is pictured in *Fig.* 9. This machine has a combination furnace and stripper unit on each side of the central blowing unit. A shell is cured in one furnace while the other pattern is being stripped and blown. By shuttling back and forth, the machine is kept fully busy and can produce two shells per minute based on a 30-sec cure.

This machine can also be made as a single-end or simplex machine. The double or duplex machine, however, can be equipped with a quick-change universal blowplate that permits handling dissimilar jobs in each of the two pattern stations. This results in considerable flexibility of operation.

In a multiple-pattern rotary-index machine, the blow plate change becomes awkward and impractical except for high production rates. Such equipment is capable of production rates of 6 to 8 shells per minute.

Shell Core Blowing

A shell-core machine is similar to a regular core blower. The sand-resin mixture, however, is blown

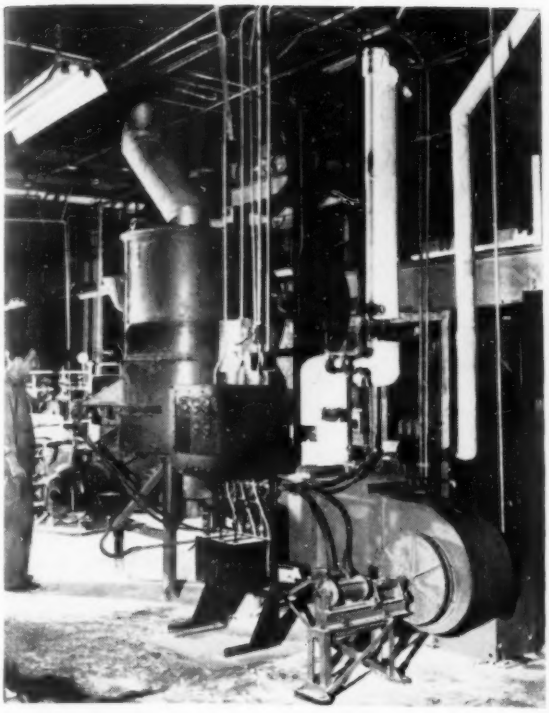
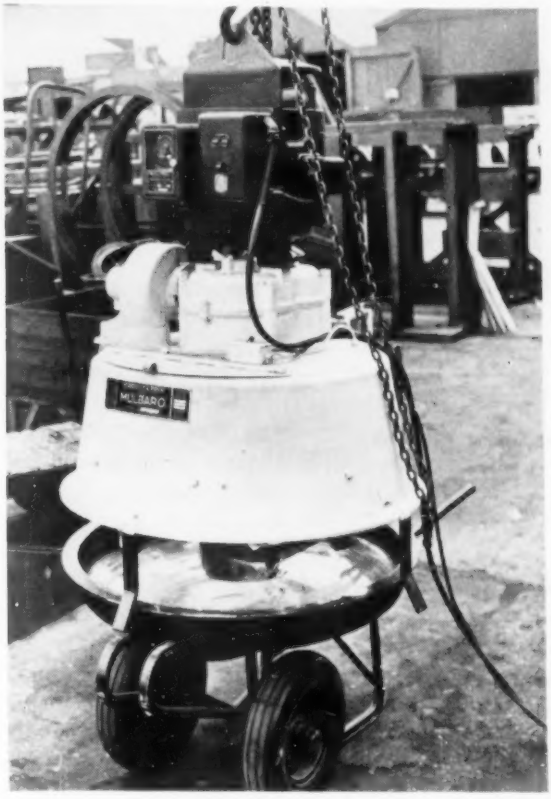


Fig. 10. (left) Resin coating can be applied to shell molding sand by either hot or cold processes in this machine.

Fig. 11. (below) Small batches of shell sand can be coated with resin by the cold process in this portable mixing machine.



into a hot core box where it remains for an investment period that determines the wall thickness of the core. The box is then inverted to permit the center portion of the core to fall out. Sometimes, inversion alone is insufficient and vibration, air blasting or suction must be used to empty out the center section of the core. Also, in some cases, a center mandrel is used, which eliminates the inversion fall-out step and controls the core wall thickness.

The box can then be opened and the core ejected or, if a longer cure is desired, it is left in the box for an additional period. Cores with longer cures burn out and collapse in the mold earlier than green cores. Core collapsibility is also controlled by core wall thickness and resin percentage in the core sand mixture. As in shell molds, time and temperature control are of paramount importance.

Resin Coating Sand

A number of resins are available for coating shell mold and core sand. These can be either liquids or solids and they end up as a film on each grain of sand. Liquid resins are available in both hot and cold types. A machine, *Fig.* 10, is available that will accommodate either type and produce from 1600 to 2000 lb of coated sand per hour. The cycle is entirely automatic and covers all phases of the operation. In the hot process, hot air is introduced in the cycle automatically at the proper time. Water is later injected to cool the sand and stop polymerization of the resin.

The same machine can also be used for dry coating. No heat is added, but the frictional heat developed by mulling the mixture melts the resin sufficiently. This machine automatically discharges the coated sand onto a vibrating screen in soft lumps. These are quickly broken up and, after falling through a screen, are blown into a cyclone and discharged where desired. Discharge into the hoppers of shell mold or shell core making machines is practical and reduces handling.

The machine shown in *Fig.* 11 is used for the cold liquid resin coating process only. It is manually loaded and unloaded and produces a 200-lb batch of coated sand in about five minutes. Loading and unloading times are extra.

Shell mold casting offers the foundry, among other things, a most inexpensive opportunity for mechanization. Shell mold equipment can and should be fully automatic and conveyorized. Shell mold and shell core making machines should pace, rather than be paced by, the operator. If this is done, the automatic shell making equipment can pace the entire foundry operation.

Roll Forming of Toothed Parts

By Harry Pelphrey*
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COLD ROLL FORMING of toothed parts is now taking its place as a recognized production process. The process combines accuracy and economy with many engineering advantages. Correct numbers of teeth are obtained by positive control. Metal is accurately displaced about the periphery of the part to form teeth with correct dimensions and spacing.

Roll-forming is a cold-working process in which a metal shaft is placed between oppositely moving racks to form teeth in a few seconds at any lengthwise position on the shaft. ASA splines and serrations, *Fig.* 1, are now being formed in quantity and SAE tapered serrations, oil grooves, etc. are formed with equal success. Roll-formed helical teeth for running gears and special use are now being tested.

Basic components of the machine are rack type forming tools, two slides and an extremely heavy C-shaped machine frame with external tie bars supporting the throat of the machine (see THE TOOL ENGINEER, July 1954, p. 57). Forming racks, *Fig.* 2, are high-carbon, high-chrome or other high-alloy steels. The required shape is accurately ground in each rack and the tooth spaces are ground with extreme accuracy on a machine especially designed for producing these tools. Tops of the rack teeth for the initial forming distance are step-ground similar to broaches.

A simplified description of the process will serve to explain its basic theory. With a part dimensioned as shown in *Fig.* 3, the heavy circle is drawn to give equal areas, below for the space and above for the tooth. Metal in the area below the circle will be dis-

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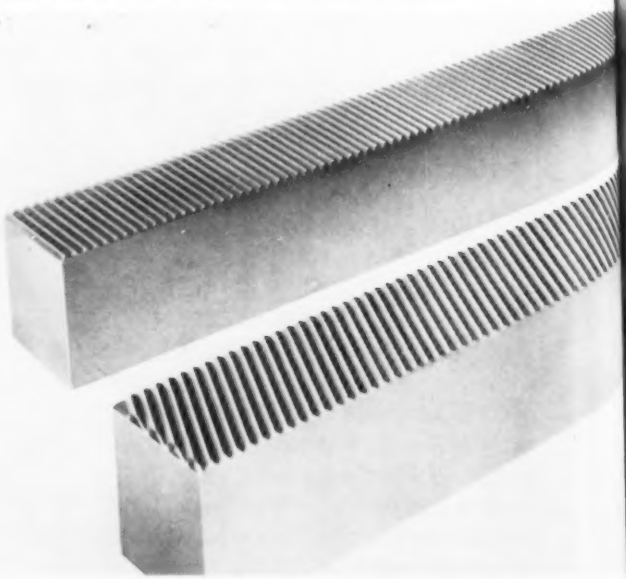
Abstracted from paper 23T9, "Rolled Forming of Toothed Parts," presented at the 23rd ASTE Annual Meeting. Copies of the complete papers are available from Society Headquarters.

Fig. 1. Representative parts made by the roll-forming process. Such parts need no other finishing.

Fig. 2. Typical racks from two sets are for forming involute spur parts, top, and involute helicoids.



placed in such a manner that it will rise to fill the tooth area above the circle. This circle represents the rolling pitch diameter, which is slightly less than the part pitch diameter, and equals the blank diameter.

Circular pitches of forming racks are made to conform with the rolling pitch diameter. Forming racks are made so that the beginning ends just contact the blank and press deeper into the part as they roll together until full depth is reached. A few additional turns are made at full depth, *Fig. A*, to set the tooth form.

To design parts to suit an existing set of forming racks, it is only necessary to reverse the process. Rolling diameter and part blank are determined from the circular pitch of the rack. The generated portion below the rolling diameter is drawn to agree with the forming racks. An equivalent area is then transferred above the circle to form the upper portions of the teeth.

Roll forming is applicable to parts with widely different shapes. As can be seen in *Fig.* 1, teeth can be formed adjacent to a shoulder without damage to the shoulder and without need for a recess. Parts that have been made by this process include: axle shafts, drive shafts, torsion bars, transmission sliding parts, starter motor shafts and tapered splines on steering shafts. Although all of these parts are for automotive use, the process can be used to form similar parts for home appliances, aircraft, and farm and industrial machinery.

Parts are designed with a chamfer at the ends of the face width. This prevents metal from being pushed over the ends and also restrains endwise movement of the top of the teeth which would reduce the diameter near the ends on the face width.

Many different types of metals have been successfully formed by this roll-forming process. Representative metals, with designations of their hardnesses, are: SAE 1037 steel (annealed), Brinell 200; SAE 1037 steel (heat treated), R_C 41; SAE 4140 steel, R_B 89-90; SAE 1145 steel, R_C 20; Nitralloy steel, R_C 32-33; 410 stainless steel, R_C 38-39; 303 stainless steel (18-8 austenitic), R_C 27-28; 24ST-4 aluminum, R_B 52-53; 61S aluminum, R_B 52-53; and copper.

Microexamination of roll-formed teeth indicates that the only place where deformation of the grains (prestressing) takes place is in the area immediately below the bottom of the roll-formed space. Examination along the edges of teeth shows the same structure as the undisturbed interior. There has been no large build-up of "dog ears" at the corners of the teeth and there has been no indication of "laps" along the tops of the teeth.

Microhardness checks have been made all over roll-formed teeth and on undisturbed portions. Maximum hardness increase was found at the prestressed area but amounted to only one point on the Rockwell C scale. This was for a part made of 1037 steel heat treated to R_C 38.

Roll-formed parts can be used as-rolled or, if necessary, can be heat treated without adverse effects. Growth or change through heat treating is comparable to that of parts made by chip-removing methods.

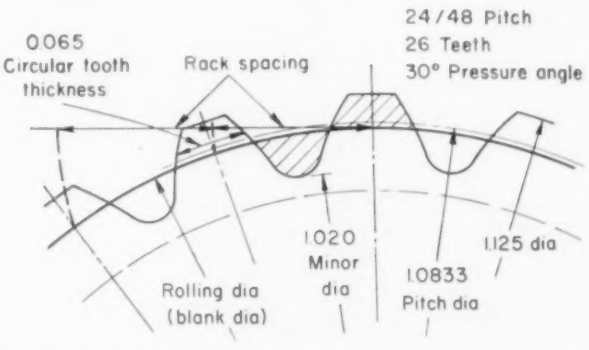
The cycle of a roll-forming machine is such that it can be adapted to manual or automatic operation. For manual operation, parts are placed on guide rails and rolled into V-grooved supports. The air-operated tailstock moves forward, lifting the part from the V-grooves. With the tailstock in this position, the part is supported, but rotates freely, between centers for forming. At the end of the forming cycle, the tailstock is retracted, the finished part is removed and a button is depressed to initiate the return stroke. Complete cycle time from one finished part to another, even with manual loading, is frequently only 10 seconds. This short time suggests complete mechanization.

For automatic operation, a conveyor could be used to index the parts in line with the machine centers, *Fig.* 5. Parts would then be automatically picked up by the centers and processed as with manual operation. By use of suitable limit switches, control could be completely automatic. The machine would then cycle automatically as long as blank shafts were presented to it.

When parts are centerless, such as those blanks produced on centerless grinders, adapters are substituted for the centers on the machine. Mechanical operation of the machine remains the same.

A natural application for roll forming is in the production of splines that have heretofore been hobbed. Involute splines, *Fig.* 6, made by the two processes were compared. Surface finish on the rolled form was found to average between 3 and 6 micro-

Fig. 3. Simplified representation of the method of designing racks for roll-forming parts to specification.



inches, rms, while the forms of identical hobbed parts had finishes of 500 microinches, rms. Feed marks, which are responsible for this high reading, are visible without magnification. In addition to the finer finish, the rolled splines were produced 30 times faster than those made by hobbing. This ratio is higher than that which would obtain in production because the hobbed splines were made with a single-thread tool.

Since tens of thousands of parts can be roll formed without the necessity of adjustments or tool changes, down time is trivial when compared with any other process for comparable production. Tool costs are minimized because there is no necessity for constant resharpening, inspection, replacement, inspection, setup, etc.

In torsional tests, rolled splines have proved to be 10 to 20 percent stronger than hobbed splines of the same size. The higher strength is gained by prestressing and also may be attributed to rearrangement of the grain structure.

Roll forming offers advantages not only in production but also in design. One design advantage results from the ability of the process to form teeth up to a shoulder without damaging the face of the shoulder. There are considerable potential savings possible through the use of smaller diameter blanks with roll forming. These savings become important when working with expensive metals. It is also possible to form a spline with the upper portions of the teeth raised above the shaft so that stepless blanks can be used.

Because the accurate displacement of metal depends on machine rigidity as well as the shape of the forming racks, strain gages played an important part during development of the roll-forming process and machines. High-speed movies were also used to advantage during initial investigation into the process. These two techniques are responsible, in large measure, for the stage of development in which the roll-forming process is today.

Fig. 4. Forming racks move horizontally in opposite directions with center-mounted part free to rotate between them.

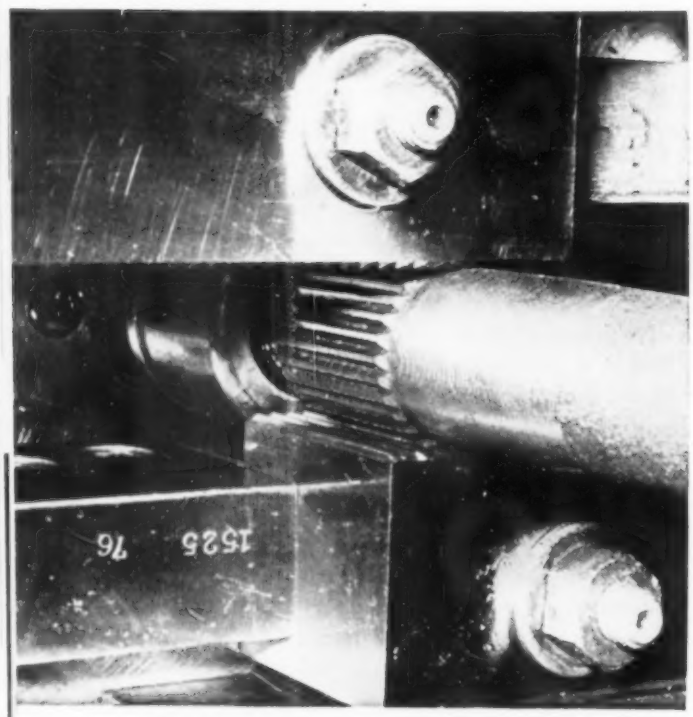


Fig. 3. Tailstock assembly can pick blanks from a conveyor in an automatic layout for the roll-forming machine.

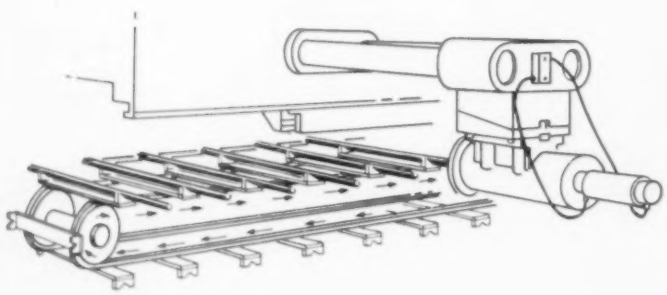
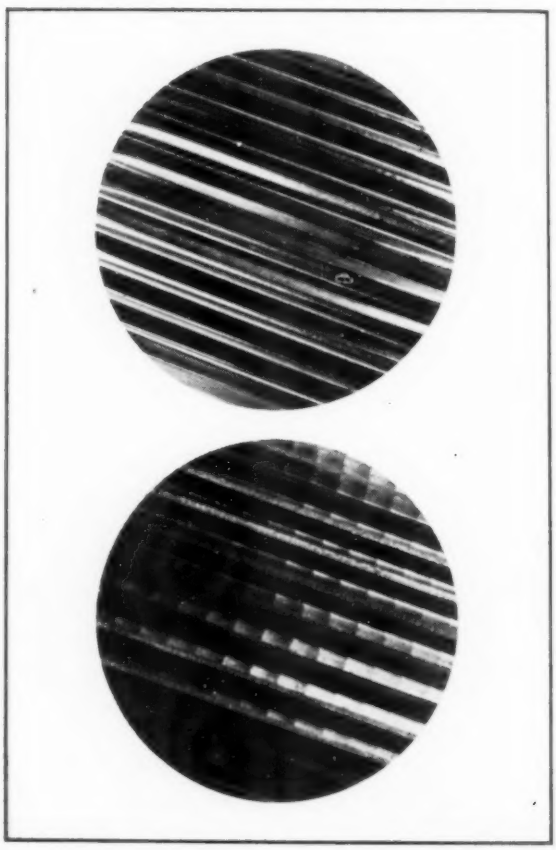


Fig. 6. Rolled teeth have better surface finish than teeth hobbed in the same material. Roughness on the hobbed teeth is determined by the feed rate.



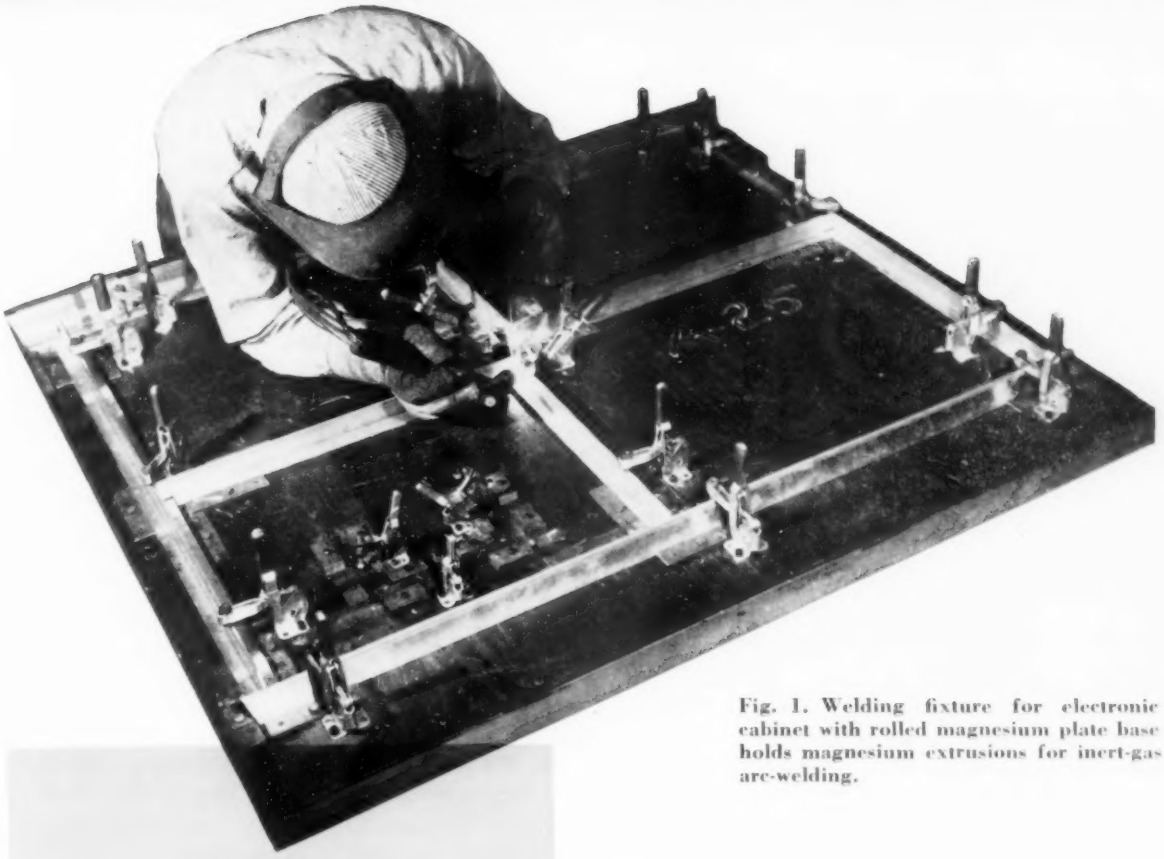


Fig. 1. Welding fixture for electronic cabinet with rolled magnesium plate base holds magnesium extrusions for inert-gas arc-welding.

Magnesium Tooling

proves economical for variety of applications

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FOR TOOLING, magnesium affords a combination of light weight and workability. Economy is achieved not only from advantageous material costs but through low fabrication costs as well. Magnesium rolled plate and extrusions have the fine-grained, porosity-free structure, toughness and strength desired. Rolled plate has close flatness tolerance and dimensional stability because it is anneal-flattened in the mill.

The anneal flattening process results in a flatness of 0.005 inch per foot and 0.015 inch in any 3 feet for plate of 1-inch thickness or less. Plate from 1 to 3-inch thickness has a flatness of 0.010 inch per foot and 0.030 inch in any 3 feet. Tensile strength of typical rolled plate is 35,000 psi. Brinell hardness is approximately 50 to 56. Wrought magnesium alloys are superior in elongation properties to cast tooling plate. Typical elongation of wrought plate is 12 percent.

Where stiffness or rigidity is required, such as in an inspection fixture or welding fixture base, *Fig.* 1, magnesium will save considerable weight and have equal or greater rigidity than other tooling materials. Magnesium in the wrought as well as cast form is free-machining, permitting heavier depths of cut and higher feed rates than other metals. An outstanding characteristic of the mate-

Abstracted from paper 23T1, "Magnesium—A Light Weight, Machinable Metal for Low Cost Tooling," presented at the 23rd ASTE Annual Meeting. Copies of the complete paper are available from Society Headquarters.

rial is its ability to acquire a fine finish from machining, eliminating the need for grinding or polishing. Excellent surfaces are produced at both high and low speeds, with and without coolant. The metal has no tendency to tear or drag. In milling, distortion from heating the work can be minimized by taking heavy roughing and fine finish cuts.

Ease of welding of magnesium is a significant advantage in tooling applications. The inert-gas-shielded tungsten arc or metal arc processes are recommended. Either helium or argon, or a mixture of the two can be used. Weld joint strengths and efficiencies are highest of the light metals. Magnesium can be readily anneal-straightened after welding to compensate for any distortion. The workpiece is simply clamped and heated in an oven at 500 F for one hour. This stress relieving process is recommended for any weldment on which subsequent machining might release welding stresses, or weldments in which residual stresses may be high enough to cause stress corrosion.

Irregular contours required for stretch dies, hydropress blocks, etc., are readily produced by routing. The finish is usually satisfactory with little or no grinding necessary. In jig and fixture work power-driven tapping guns can be used for tapping large numbers of holes, saving 25 percent of the time required for hand tapping. Coarse threads are used in magnesium. However, steel thread inserts are available for use in tapped holes where cap screws are to be removed frequently.

Large-radius bends on magnesium plate and extrusions can be made at room temperature, but work-hardening characteristics are such that temperatures from 300 to 600 F must be used for forming of any severity. The coefficient of expansion of magnesium approximately equals that of aluminum but is appreciably higher than steel. For close tolerance work, the room temperature and that developed in the part should be taken into consideration. Magnesium alloys are resistant to alkalies and therefore can be used for bases and grids for plaster masters without danger of corrosion.

Contrary to a rather widely held opinion, handling of magnesium involves no great industrial hazard if a few simple precautions, and good housekeeping rules are followed. Chips and dust should not be allowed to accumulate on machines or operators' clothing. Only mineral oil coolants should be used and wetting of magnesium chips with water should be avoided. (See THE TOOL ENGINEER, November 1953, pp. 45-47.) Questions on specific installations can usually be answered by industrial insurance agencies.

Typical Applications

Inspection Fixtures: Because inspection fixtures must be portable yet rigid enough to maintain close tolerances, magnesium is used in the household appliance, aircraft and automotive parts industries. Another reason is that inspection equipment in these industries is frequently handled by

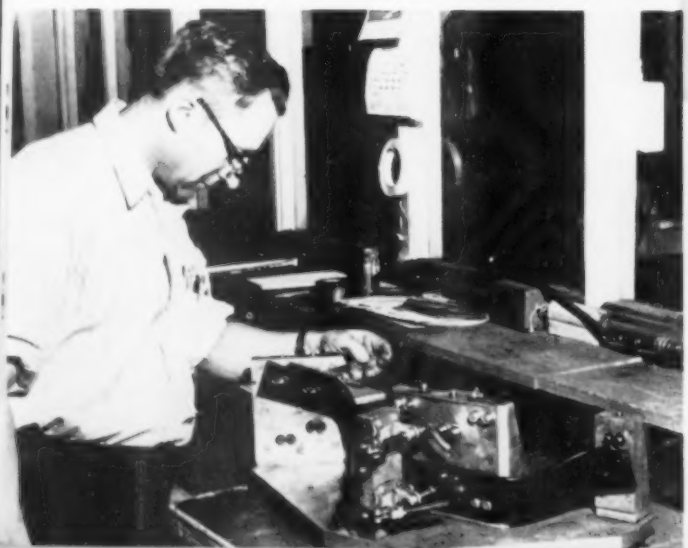
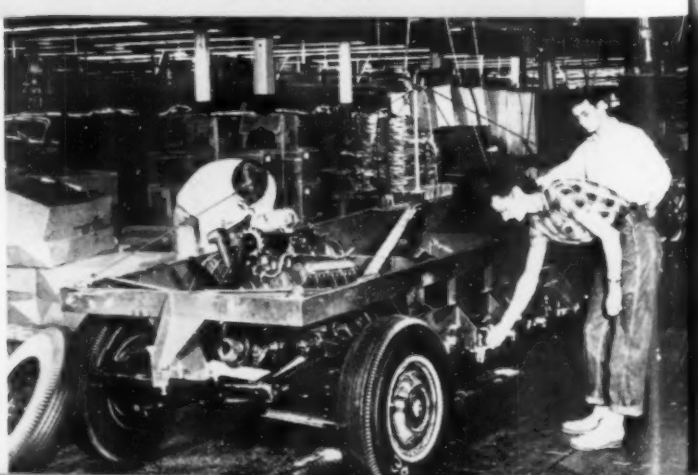


Fig. 2. (top left) Aircraft wing rib is checked in magnesium fixture at Ford plant, Kansas City.

Fig. 3. (bottom left) Use of magnesium in auto bumper bar fixture results in ease of handling with desired rigidity.

Fig. 4. (below) Auto frame checking fixture of magnesium, designed and built by Magline, Inc., represents a weight reduction of 90 percent over steel fixture it replaced.



women and must be held to certain weight limits. In one instance, Westinghouse Electric Corp., Appliance Div., approximately 50 percent of the checking fixtures and contour checking boards have been made of magnesium tooling plate.

Rolled plate, anneal-flattened, is used as a base for checking fixtures without requiring surface machining. The checking fixture shown in *Fig.* 2 was made of ½ inch thick rolled plate with extruded members attached for footing and added rigidity. Thirty-one similar magnesium bases were made with a net saving of $1045 compared with costs for previously used materials. Freedom from warpage due to sawing and boring of holes was a further advantage.

Another example of a magnesium checking fixture is shown in *Fig.* 3. It is used to inspect hole locations and contours in the secondary bumper bar shown in position. While such fixtures are stationary in use, they must be carried from location to location, making light weight desirable. Since the required flatness tolerance of 0.002 inch per foot exceeded that of commercial plate, the bases were machined. Surfaces of the upright blocks were faced with steel to prevent scoring of the magnesium by the steel parts.

Large magnesium frame checking fixtures, such as shown in *Fig.* 4, are used in gaging for shims between automotive frames and bodies, to assure proper body alignment.

The fixture was inert arc welded from 4-inch stock magnesium channels and ⅜-inch plate. The four main checking pads, 60 inches apart lengthwise and 46½ inches apart in width must be held within 0.010 inch. Other dimensions, including 15 adjustable checking points are within ± 1/16 inch. The advantages of easy anneal-straightening were demonstrated in this application. After welding and stress relieving (4 hours at 400 F) the fixture was checked and two of the main pads were within 0.002 inch of the nominal. The other two required only 0.010 and 0.020-inch shims respectively.

The completed fixture weighs 270 lb. Of the total weight 230 lb is magnesium. The fabricated steel unit it replaces weighed 2500 lb.

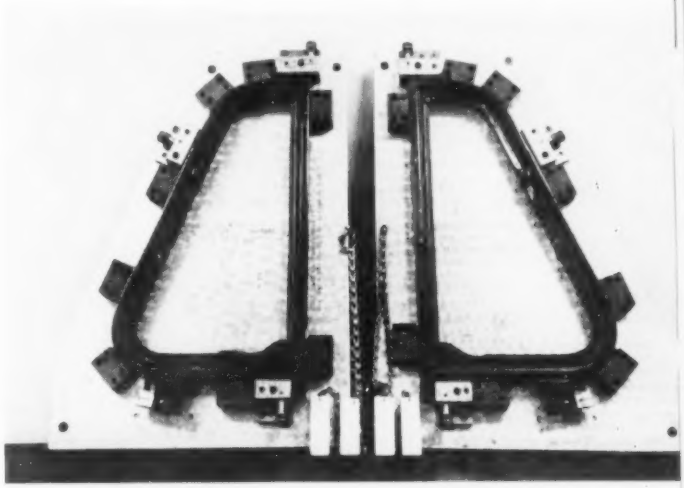
The fixtures in *Fig.* 5 were built by Excel Corp., Elkhart, Ind. for checking auto window frames. Flatness of the magnesium tooling plate used for the base was satisfactory as supplied. Swirl marks were applied to give an expensive appearance to encourage personnel to treat the tools with care.

In another instance, a tubular glass fiber frame built to check canopy hole locations on an aircraft fuselage was unsatisfactory because of insufficient rigidity. Check points on an out-of-tolerance fuselage could be forced into alignment.

Deflection tests by the tooling department indicated magnesium tubing to be better for this use with less than ¼ the deflection of the other material for the same load. In addition, magnesium proved to be both lighter and less expensive. The tubular magnesium framework was heliarc welded and oven stress relieved. It solved the inspection problem.

Machining Fixtures and Toolholders: Magnesium is used for short-run fixtures to reduce lead time between tool design and parts manufacture. Also, tool engineers believe, in many cases, if steel had to be used it would not be economical to tool for the job. A separate setup would be required for each part.

The milling fixture shown in *Fig.* 6 is an example of such a situation. Total run of parts on this fixture was only 25, yet the inexpensive magnesium tooling is adequate. Again, for the odd shape of the holding fixture shown in *Fig.* 7 the relative ease of machining in magnesium compared to steel



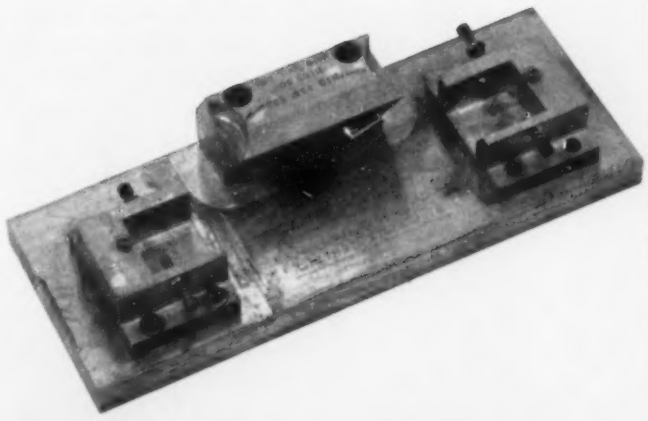
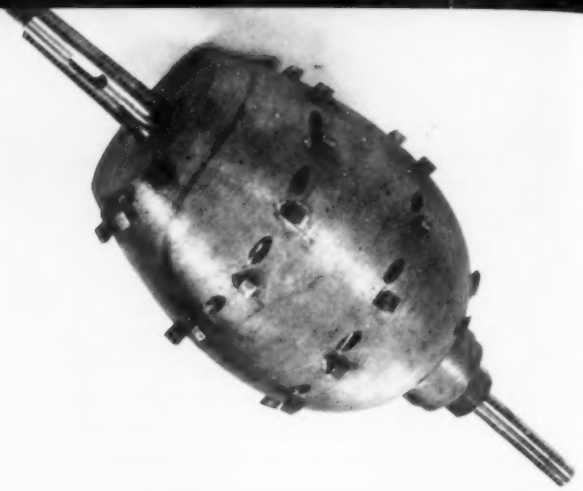


Fig. 5. (top right) Auto vent window checking fixture with magnesium base.

Fig. 6. (right) Short run milling fixture was economically built of magnesium plate.



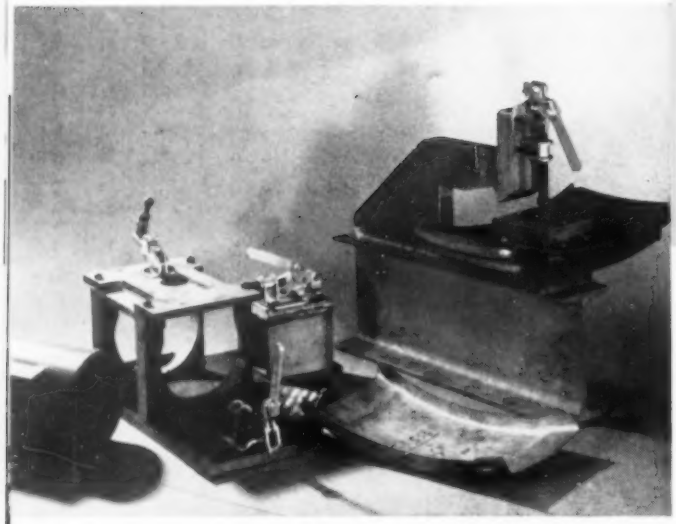


Fig. 7. (top left) Parabolic contour was machined in magnesium lathe fixture.

Fig. 8. (above) Form milling cutter having magnesium body with cutter teeth insets, designed by tool engineers at Dalmo-Victor plant at San Carlos, Calif.

Fig. 9. (left) Magnesium's workability was utilized in irregularly contoured routing jigs.

proved to be quite advantageous.

This lathe fixture was designed for machining a parabolic magnesium reflector requiring considerable accuracy. Holes and slots in the face accommodate a bracket welded to the back of the reflector. The reflector contour is machined and the assembly is oven stress relieved while st clamped in the fixture.

Another tooling use of magnesium is in a fo milling cutter, *Fig.* 8, for shaping the face o radar reflector. The reflector is a trough shaped magnesium casting resembling a bulldozer blade. The tool body was made from a magnesium extrusion rough shaped on a lathe. Cutter teeth were inset and the contour ground on the cutter points. The tool body was made of magnesium to utilize its vibration damping properties in reducing chatter.

Assembly and Locating Fixtures: Typical fixtures include a series of sets for field modification of the Republic F84F wing trailing edge. Square tubing and tooling plate were used for these sets. Fabricating the truss type frames for this job involved extensive inert-gas arc-welding of tubing to plate. Considerable machining and contouring were also required on the plate. Rudder and stabilizer throw-setting fixtures at Republic are commonly fabricated of welded magnesium tubing.

Automotive subassembly operations are expedited with a magnesium front end assembly jig. This requires 1540 lb of magnesium sand castings, whereas of cast iron, the jig would weigh over 6000 lb and be difficult to maneuver. In producing 9 jigs, it is estimated that approximately $6,000 was saved in machining costs. Before machining, the castings were given a stabilizing heat treatment of 4 hours at 500 F.

Another usage of magnesium tooling is at Lear, Inc., Santa Monica, Calif. for rebuilding Lockheed Lodestar type airplanes into executive transports. Top speed is increased from 221 to 325 miles per hour by aerodynamic refinements and more power.

A significant portion of this speed increase is achieved by a completely redesigned ring cowling which is assembled to close tolerance in magnesium locating jigs. The prototype cowling was assembled without a jig. Later ones, assembled in the jig, increased top speed by 15 miles per hour because of the closer tolerance.

These jigs had to be light enough for two men to handle when taken apart. Diameter tolerance on the machined rings was held to ± 0.005 inch. Stations in the longitudinal direction were held to ± 0.010 inch.

Welding Fixtures: The as-rolled surface flatness of magnesium tooling plate has been adequate to allow its use as a base surface for welding fixtures, such as the one shown in *Fig.* 1. Fixtures of

this type are used in Dow's fabrication plant in welding subassemblies and assemblies of large electronic cabinets. Formerly, planing operations on a steel plate base required as much as 12 hours of planer time. Part tolerance held in welding eight-foot cabinets is as close as $\pm$ $\frac{1}{32}$ inch.

At Western Electric Co. grooved copper backups are inserted in milled slots of magnesium fixture bases where weld beads are made against the base. This provides a backup of highest conductivity with a high melting point. Practice in Dow Co. for this situation is to use the magnesium itself as a backup.

Since spot welding fixtures must be carried to and positioned on spot welders manually, magnesium makes an ideal construction material. Over the years the company's fabrication plant has used a variety of magnesium spot-weld fixtures.

Drill, Routing and Fly Cutting Jigs: The fabrication plant has also made extensive use of magnesium plate and extrusions in drill, routing and fly cutting jigs, such as shown in *Fig.* 9. Router boards, which serve as a template to guide the cutter, usually are set up manually and light weight is important in decreasing handling time.

These jigs are band sawed to rough contour, then band filed to the contour line. Large and complex routing fixtures, such as in *Fig.* 10, are assembled by bolting, while simpler jigs are joined by welding.

Rubber Pad Form Blocks: Good results have been secured from magnesium alloy form blocks for hot forming magnesium. Stiffening ribs of magnesium sheet and control surface skins for private aircraft are formed at 350 F.

Magnesium fabricators for years have been using magnesium plate form blocks for hot hydropress forming. Best results are obtained with temperatures below 400 F, as above this temperature there may be a tendency for blocks to creep. As many as 500 parts have been formed without change in die dimensions.

Rolled magnesium plate is much tougher and does not have the porosity drawback of cast materials for form blocks. Over-cut areas can easily be salvaged by building up with arc welding. Surfaces generally are smooth enough after routing that finish grinding can be eliminated.

Stretch Forming Dies: This is an application where magnesium has definite advantages, i.e., as a material against which to stretch form aluminum shapes. Galling from stretching aluminum against aluminum is a real problem in the aircraft industry. The dense, fine-grain porosity-free structure of magnesium, plus a natural "greasiness" is reported by aircraft companies to eliminate galling. The latter characteristic may be attributed to the lower coefficient of friction resulting from dissimilar metal contact.

In one instance, stretching a 2 x 2 x $\frac{1}{4}$-inch 24S-T4 angle on an aluminum die, galling was a problem, even with a lubricant. Without a lubricant over 100 of the same parts were stretched on a magnesium die with galling completely eliminated.

Vibration Test Fixtures: In vibration testing, figures for holding test parts must be rigid yet of low mass. Also, to prevent resonant vibration, stiffness combined with low mass and high damping capacity are required.

Magnesium is used in some of the more difficult applications because of its favorable characteristics. Examples are vibration test fixtures for radar equipment, including radar antennae. Such fixtures have been fabricated from magnesium tooling plate and tubing by welding. In at least one instance at Dalmo-Victor Co., San Carlos, Calif., engineers believe magnesium is the only available material that could be used because of the low weight-to-strength ratio required.

While these are typical examples of magnesium tooling, there are doubtless many other applications where the properties of this metal are used advantageously.

Fig. 10. Fixture for routing jet engine nacelle fairing has magnesium body.

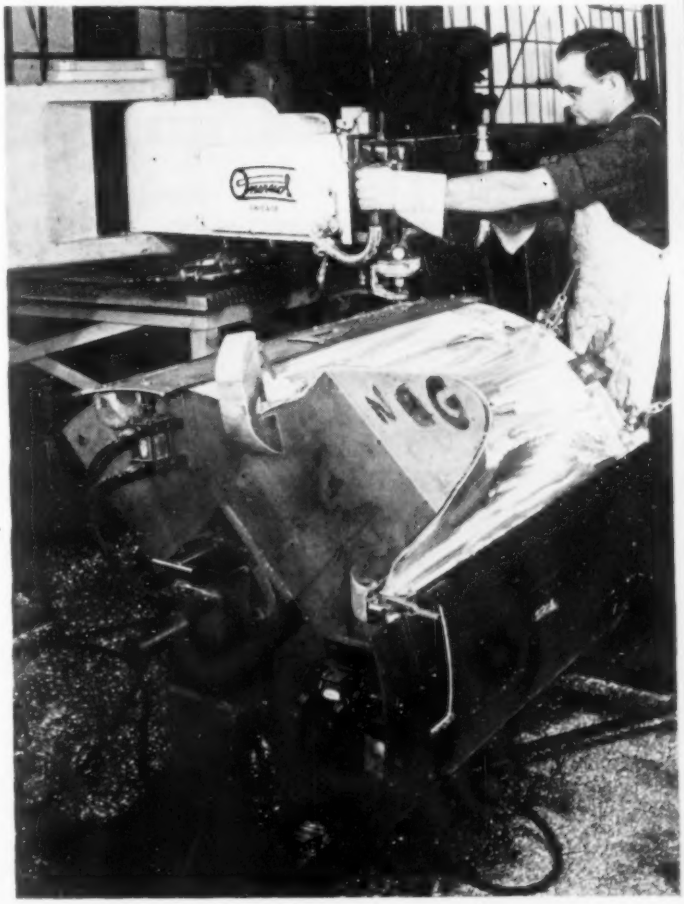


Fig. 1. Microfilm copies of 1,300,000 engineering drawings are processed and filed to conserve floor space and provide for service requests on past models.

Coding and Administration of Engineering Drawings

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Abstracted from paper 23T3, "Coding and Administration of Engineering Drawings," presented at the 23rd ASTE Annual Meeting. Copies of the complete paper are available from Society Headquarters.

ADMINISTRATION OF DRAWINGS appears to involve few problems in comparison with the highly complex problems of engineering. Recording, *Fig.* 1, and distributing complex product engineering and tooling information, however, is of major importance to engineers as well as the company as a whole. Coding of drawings is critical as a means of eliminating a potential bottleneck.

Numbering and coding of drawings at Ford Motor Co. is much more complex today than in 1932 when a significant numbering system was developed. Many more models and designs are produced today. The system then was based on far fewer and less intricate parts than are now required.

For example, in 1932 one frame assembly, consisting of approximately 30 different pieces, served all product lines. Today there are 47 assemblies consisting of 102 major pieces. A numbering system for today's numerous styles and types of cars, demands more flexibility.

The coding system developed may be neither necessary nor effective in another company. Many systems have been devised to meet particular needs. Each system has its own characteristics, which though effective for one company, may create a bottleneck in another. Thus, some companies use

an assembly system in which each assembly is assigned a number and all details of the assembly a suffix number. Other companies use only numerical digits in sequential order and still others use a combination of letters and numerals.

In identifying engineering drawings two principles should be considered: part number and nomenclature. A part number is assigned to give identity by code to either a part or an assembly designed for a specific application. Nomenclature is used to classify the part by indicating the primary function for which the part was designed.

In a typical significant part numbering system each letter or number has a certain meaning. As used by Ford such an engineering part number is divided into three sections: a prefix, a basic part number and a suffix. For instance, the number for a "Side member and reinforcement assy. frame" is 8R8THFS-5013-A. The first digit in the prefix indicates the year (in this case the year 1948), the letter "R" indicates the type of engine. The next figure, "8," is the last figure in the wheelbase: (128) inches. The two letters, "T" and "H" designate the truck model; the letter "F" means right-hand drive; and the last letter "S" denotes "special order." This represents seven significant identification digits in a prefix, which is the maximum. Not all prefixes carry as many significant symbols, but some similar combination is used. In this system, extreme caution must be used in assignment of part numbers.

Experience has taught that too much significance in part number prefixes can be confusing. Many people receiving blueprints try to use the drawing to indicate vehicle usage. Due to program changes, the part as released may no longer be used on the particular vehicle for which the prefix was originally assigned. For example, a part might be designed for a Mercury passenger car and assigned a corresponding prefix but, due to design or program changes, is finally used on a Ford passenger car. The part number is not revised to indicate this change in vehicle usage because of tools and patterns already in process or completed, as well as other published records in which the original part number prefix is used. The result is a part number no longer significant as to model usage.

When the need arose for projecting yearly design programs over a greater number of design years, the part number prefix problem became proportionately greater. Because part number significance is tied to model year designations, weakened security resulted from information becoming available too soon before the initial production release. This led to modification of the system to show two letters only instead of the previous maximum of 7 digits. The first letter indicates the vehicle line and the second letter indicates the model year for which the part is designed. Thus, "A" now stands for Ford passenger car, "E" is engine, "L" is Lincoln, "M" is Mercury, "P" is for transmission and "T" represents Ford truck.

The adoption of this change expedited part number assignments. It failed, however, to solve all difficulties. Foremost was the problem arising from decentralization of the various manufacturing units, which entailed assignment of product engineering responsibility to certain divisions. This created the need for new letters in the prefix to designate the decentralized units.

With only one letter used in the prefix to indicate the vehicle line and with the elimination of I, O, Q and X, usable letters were limited to 22. The assignment of letters to the new decentralized divisions had to be undertaken with caution, in order to retain letters for future expansion.

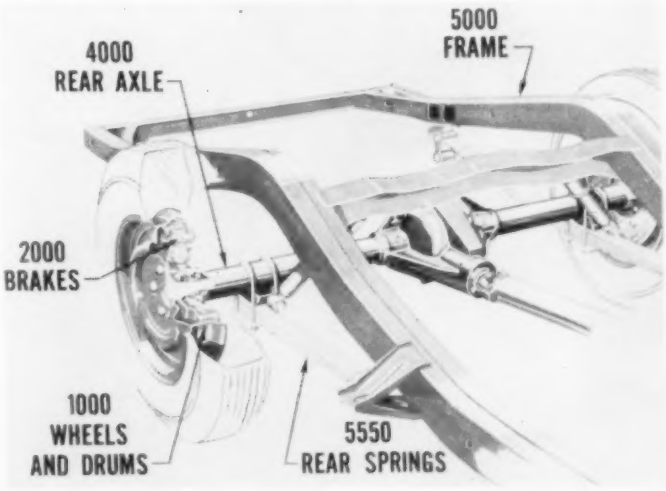
The next section of the part number is the basic part number, sometimes called the group number. Every part in a vehicle must be assigned a number in some group. The chassis group consists of four digits and the body group of five digits. Basic number assignments of components in the chassis group, *Fig.* 2, are as follows:

1000-1250	Wheels, hubs & rims
2000-2449	Brakes
3000-3476	Front axle & front suspension
4000-4799	Rear axle & driveshaft
5000-5149	Frame & brackets
6000-6899	Engine
7000-7499	Transmission & shifting controls
8000-8499	Radiator & grill

Within these component groups, individual numbers are assigned against a part name. Once a number has been assigned for a part name no other number can be assigned to the same part.

In further detail the illustration, *Fig.* 3, shows a

Fig. 2. Typical basic part numbers for some of chassis components illustrate principle of assigning drawing numbers by related groups.



front wheel brake assembly, with each part in the assembly assigned a significant number in the brake group. For instance, the front wheel brake primary shoe lining has been assigned number 2021 and the front wheel brake secondary shoe lining is 2022.

The body is also divided into groups representing various body components or assemblies, *Fig.* 4. While most chassis parts are common to all body styles for any vehicle model, this is not true of body parts where many different body styles exist for each vehicle model. It is necessary to identify the various parts with a particular body. Thus: Model 70 is used for a two-door sedan, Model 73 for a four-door sedan and so on.

The illustration shows a typical body number for a door assembly. The first two digits represent the body type for which the part was designed and the last five digits the basic number for the body component.

The first three digits of the basic number are designated as group numbers since they indicate the function or group of the part or assembly. The last two digits are the detail numbers which identify the different parts within the basic group. Thus, the basic number of all parts within the specified function "Front Door" begin with the digits 201. Only the Door Assembly Front—Less Paint and Trim is assigned detail number 22, to make up the basic part number 20122.

This basic numbering system has been highly successful because it has provided divisions of the company and dealers a quick reference number for a given part. With proper tags on the part bins listing the model year and vehicle usage, production employees as well as dealer servicemen were able to locate stock quickly. Such was the case up to 1952. At this point the company introduced completely new vehicles with many more body types and the system had to be modified so that most of the detailed significance was removed from prefixes.

The last section of the part number is the suffix. When color identification is not required, only one letter is used in this section. Initial designs of a part or assembly are released with a suffix "A". The part number suffix for each succeeding design of the part or assembly advances alphabetically. For example, BC-7003598-A, Windshield Garnish Moulding, would be the initial design. If changes are required that affect interchangeability, a new suffix letter is issued and the new part number is BC-7003598-B.

On those parts which require color identification, namely, body parts, a second letter is used. Thus, if the second letter is a "W", the part is to be white. Because of the number of paint combinations, it sometimes becomes necessary to use two letters to indicate all paint colors in a vehicle year. This, then, results in a suffix of three letters.

In addition to the significant part numbering system for product engineering drawings, a similar system is used for production and tool drawings. Once a production drawing is released for manu-

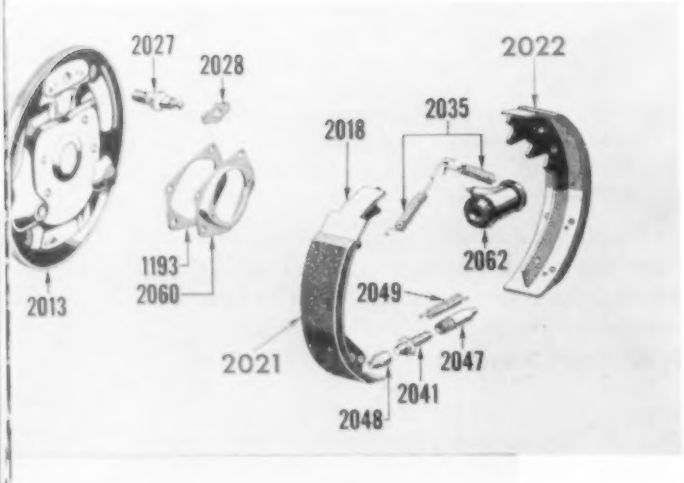


Fig. 3. (top) Breakdown of basic part numbers within the brake group. Shown is the left-hand front brake assembly, MC-2011-C.

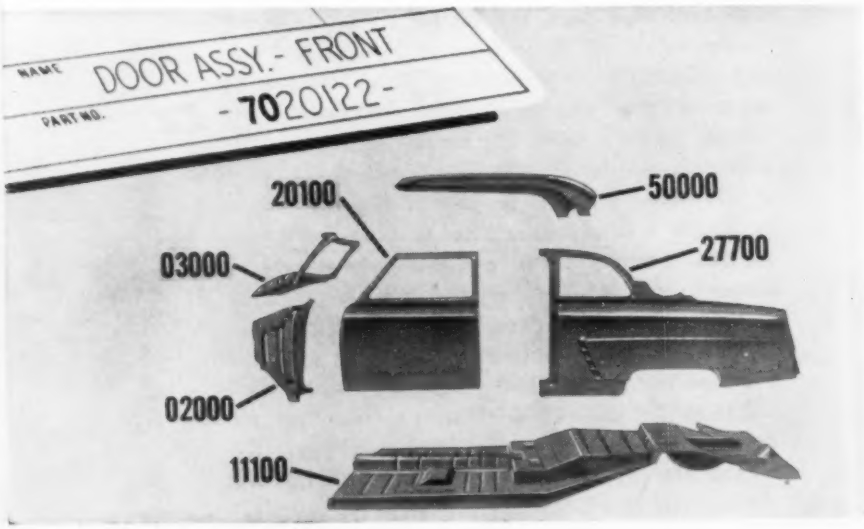


Fig. 4. (right) Basic number of body, 70 for 2-door sedan, is added to part number to distinguish body type on which part is used.

facturing use, it is necessary for manufacturing engineering to prepare numerous tool design drawings, *Fig.* 5, for producing the part.

Drawings made by tool design are divided into two main categories:

1. A drawing number with a letter "Z" in the prefix is assigned to drawings made for special tools, dies, jigs, fixtures, gages, equipment and other miscellaneous items for use in the manufacture of any automotive or related commercial product.
2. A drawing number with a letter "S" in the prefix is assigned to drawings made for special tools, machines and equipment used to fabricate or repair items made from a drawing with a "Z" in the prefix.

The illustration, *Fig.* 5, shows a typical example of a tooling part number. The "69-Z" refers to the applicable tool classification number; the "F" to the division or staff that designed the tool and "501" to the identifying number of the individual tool in this classification series. Individual tool identification numbers in each classification start with number 1 and continue consecutively.

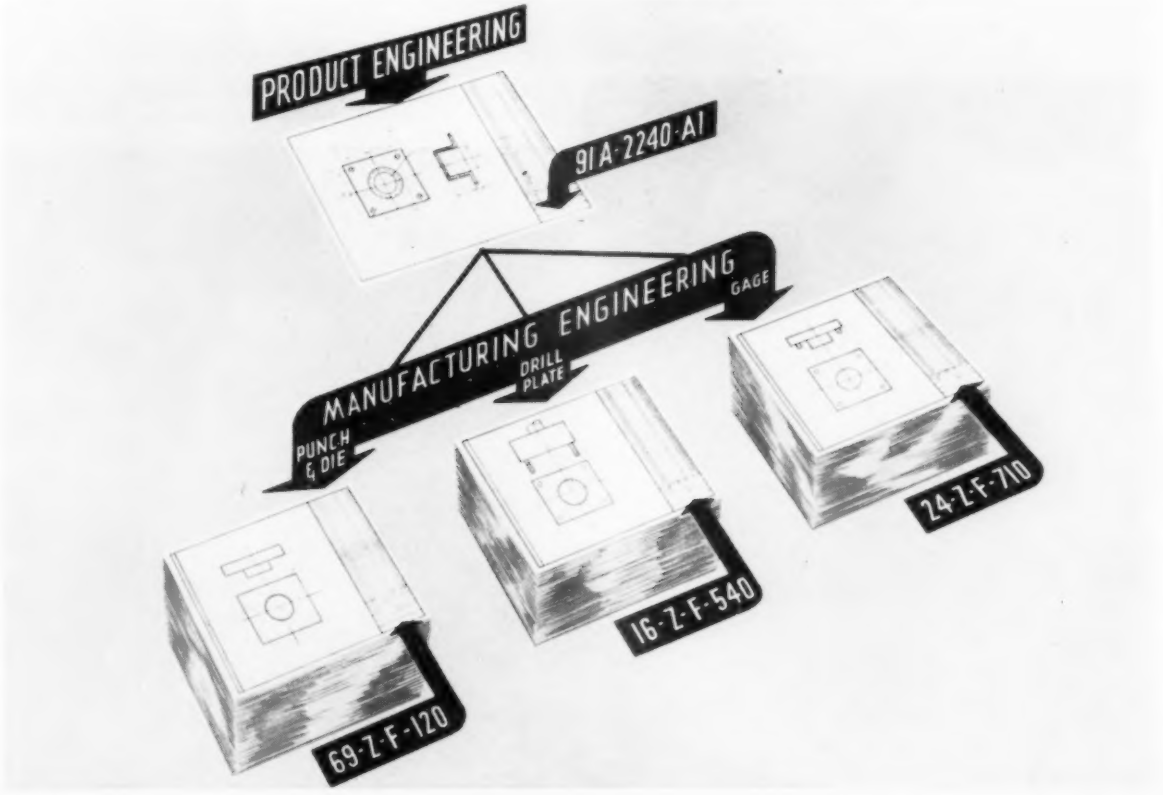
One major exception to the significant numbering system is standard parts. These items, i.e., nuts, bolts, washers and rivets are so widely interchangeable that number significance is of little value. By assigning numbers consecutively, and listing them in a standard parts catalog, fewer problems arise. This also saves many hours of drafting time since individual drawings are not required.

To this point, emphasis has been placed on the necessity of analyzing, modifying and even experimenting with coding systems to expedite the recording and distribution of engineering information. There are also many problems in the administration of engineering drawings, especially in a rapidly growing organization.

As a company expands and requires more space, management is confronted with the problem of office and plant expansion or decentralization operations. If a decision is made to move certain operations some distance from the home office, management is confronted with a serious administrative problem. All master records located in the home office must be duplicated to establish equivalent information in the new locations. Systems must be revised to signify where drawings are created and who has design responsibility. Drafting standards that were common knowledge in one location must now be published in a manual as the basic standard to be followed at all company locations. Basic drawing forms must be studied and revised to provide space for recording essential information on the drawing.

Protection of vital records against fire must also be provided to insure continued operation in event of a major disaster. This was emphasized by the

Fig. 5. Significant part numbering system is used on tooling drawings as well as product drawings. While only 3 sq ft of linen were required for the part drawing, approximately 283 sq ft were needed for tools.



Detroit Transmission fire in 1953. Records needed for reconstruction include legal documents, patents and engineering drawings. Microfilm copies of these are produced both in negative and positive form. One of the films is stored at the applicable product engineering location and the other at a distant fireproof storage vault.

As each drawing is released for production, procurement, or fabrication, a 70 mm microfilm record of it is made immediately after the reproducibles. At the end of each day, the film is delivered by messenger to a photographic firm. This company, after developing the negative, makes an additional positive film record which is sent to the records depository vault for permanent retention.

These microfilm files conserve many square feet of floor space and provide ready reference for unusual requirements for past records, *Fig.* 1. After 10 years original drawings are destroyed and any requests for prints must be provided from microfilms. This may occur quite frequently even after 10 years, due to the service requirements.

To insure good negatives, a careful control must be kept over drafting standards and particular attention paid to line quality, lettering and numbers. Also, careful consideration must be given to the part numbering and filing system that is used.

Each film is placed in a separate envelope and filed by drawing part number. When a change is made on the drawing, additional film copies of the drawing are inserted in the envelope. If films of drawings were left in roll form, an additional log sheet or index file would have to be maintained to indicate roll number and location on the roll of each change made to a drawing.

In addition to these uses, microfilm serves another purpose. It eliminates the necessity of blueprint shipments to overseas plants. In the past, many weeks elapsed until blueprints arrived in Europe. Today weekly air mail packages of 70 mm microfilm are sent overseas. These plants are now never more than two weeks out of date on part changes.

In the administration of engineering drawings, the location of the part number on the drawing determines whether regular size cabinets may be used instead of more costly special sizes. As indicated in the illustration, *Fig.* 6, the primary part numbers are located in the right-hand lower corner for reference purposes when the drawing is in use. However, a secondary location is also used, so that, when the print is folded, the part number appears in the upper right-hand corner in the file cabinet.

Effective use of office furniture standards in conjunction with drafting standards will eliminate a collection of odd-size files and make standard file cabinets available for their full amortization periods.

This is merely another of the problems that indicates that any numbering system a company may adopt will be only a small portion of administrative engineering work. Methods of printing, reproduction, distribution, release systems, drafting practices, drafting equipment standards, industry standards and many other factors must be considered.

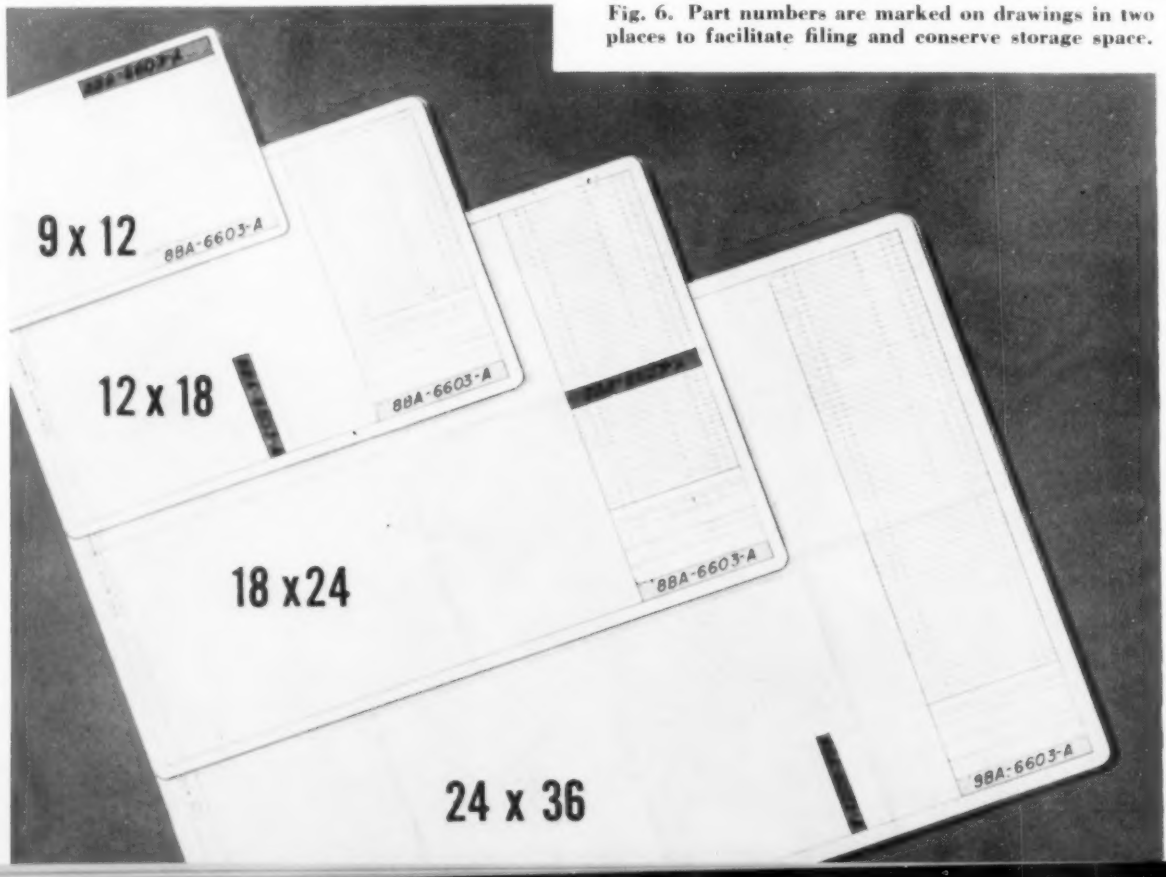
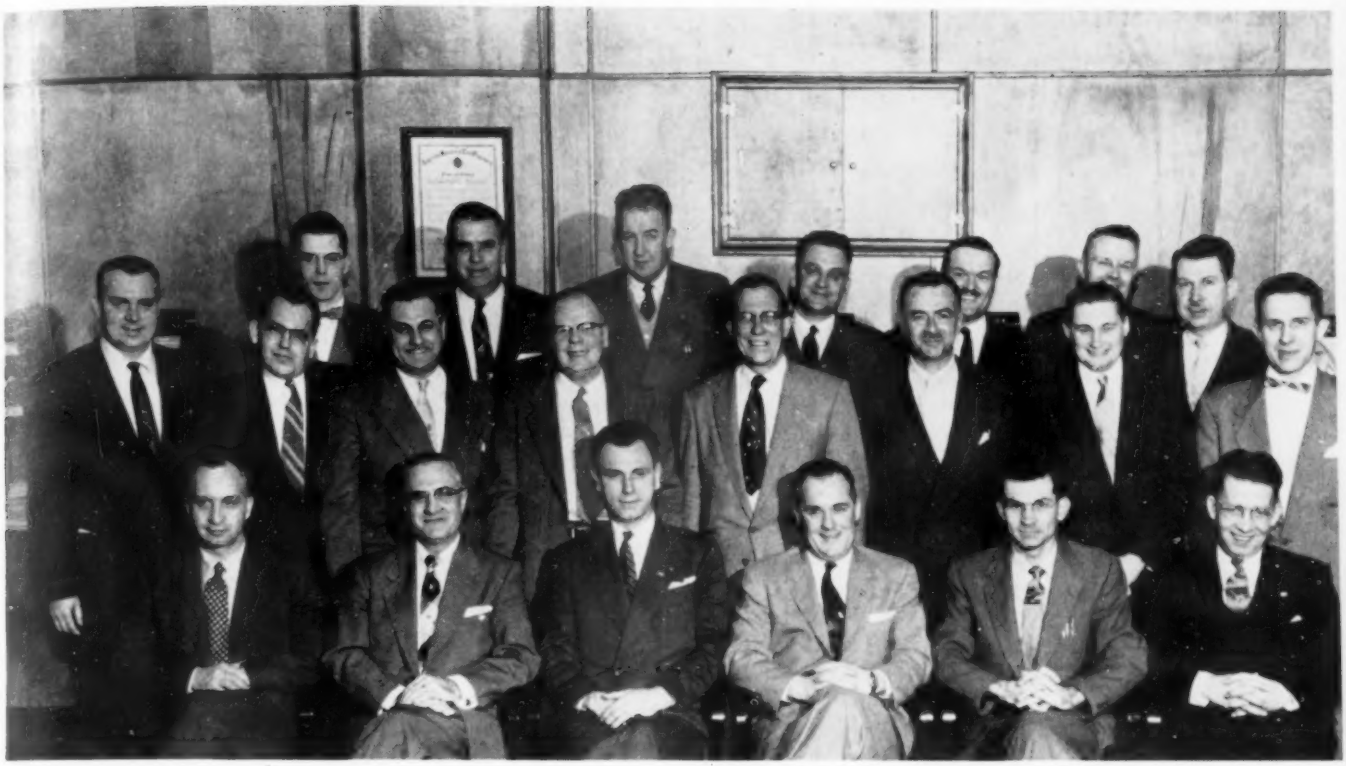


Fig. 6. Part numbers are marked on drawings in two places to facilitate filing and conserve storage space.



Canadian chapter representatives met recently with national ASTE officers to exchange ideas on chapter operations and activities. The occasion was the semiannual Canadian Regional Meeting, held on February 19 at Society Headquarters in Detroit.

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aste news bulletin

Los Angeles, Calif. March 17 (By Special Wire)—New National Officers of the American Society of Tool Engineers were elected today at the annual meeting of the Board of Directors. President of the 31,000-member society is Harry B. Osborn, Jr. of Cleveland, Ohio.

Serving with him are; first vice president—Howard C. McMillen, Bedford, Ind.; second vice president—Harold E. Collins, Houston,Tex.; third vice president—Raymond C. W. Peterson, Toledo, Ohio; fourth vice president—Wayne Ewing, Los Angeles, Calif.; treasurer—H. Dale Long, Chicago, Ill.; and secretary—John X. Ryneska, Boston, Mass. Preceding the election, the board voted to establish a new position of fourth vice president and abolish the post of assistant secretary-treasurer.

The officers were installed at the membership banquet, held at the Ambassador Hotel's Cocoanut Grove, by retiring President Joseph P. Crosby. With the exception of Mr. Ryneska, all were named yesterday as national directors for 1955-56 by the house of delegates.

New members of the Board of Directors are William Moreland of Rockford, Ill. and William A. Thomas of Windsor, Ont., Can.

Incumbent directors who will serve another term include: A. B. Clark, Cleveland, Ohio; Willis G. Ehrhardt, St. Louis, Mo.; George A. Goodwin, Dayton, Ohio; James O. Horne, Rochester N. Y.; Charles M. Smillie, Detroit, Mich.; and Richard A. Smith, West Hartford, Conn.

As provided in the ASTE Constitution, Mr. Crosby as retiring president automatically becomes the fifteenth member of the board.

National directors for the next year will take office in October when they are installed at the semiannual meeting.

Together with technical conferences and plant tours, the board meeting, house of delegates session and the membership banquet were part of a busy week of activities held in connection with the ASTE Western Industrial Exposition and 1955 annual meeting.

Philip M. McKenna

Fred H. Colvin

O. B. Jones

Ernest R. Breech

ASTE Gold Medals Presented

Honoring outstanding contributions in the field of tool engineering, the first presentation of the recently established Gold Medal Awards of the American Society of Tool Engineers was made March 17 by Joseph P. Crosby, retiring ASTE president, at a ceremony in Los Angeles, Calif. The occasion was the Society's 1955 annual membership banquet held at the Ambassador Hotel.

The four awards and the recipients are:

ASTE Progress Award, for engineering accomplishments in the field of manufacturing techniques and production methods, was presented to Ernest R. Breech, chairman of the board, Ford Motor Co.

ASTE Gold Medal, for outstanding service through published literature, technical writings or papers, was presented to Fred H. Colvin, editor emeritus, *American Machinist.*

Joseph A. Siegel Memorial Award, perpetuated by Society past presidents in memory of the first president of ASTE, for contributions through leadership, voluntary support, or acts of timely benefit to ASTE, was presented to O. B. Jones, president, Detroit College of Applied Science, and a founder of ASTE.

ASTE Engineering Citation, for unusual skill in the development of tool engineering principles, was presented to Philip M. McKenna, president of Kennametal, Inc.

Engraved certificates were also presented to the award winners by President Crosby. The awards themselves, which are of the plaque type suitable for wall mounting, include gold medallions about three inches in diameter and plates with the recipients' names.

All plans and arrangements for the Gold Medals were in the hands of members of the ASTE Honor Awards Committee. In making the awards, President Crosby paid tribute to the entire committee for its "swift and most competent planning and execution to the least and last of the innumerable details."

Comprised of the nine past presidents who are oldest in terms of office, the Honor Awards Committee for 1954-55 is headed by T. Bert Carpenter of Detroit. Vice chairman is Frank W. Curtis, also of Detroit.

Other members are: Douglas D. Burnside of Cleveland, Ohio; A. H. d'Arcambal of West Hartford, Conn.; Ray H. Morris, also of West Hartford; James R. Weaver of Springfield, Mass.; Otto W. Winter of Grand Island, N. Y.; Frank A. Shuler and Walter F. Wagner, both of Detroit.

Acting as marshals at the presentation ceremonies were Messrs. Carpenter, Shuler, Wagner and Weaver.

The awards will be presented annually to promote the art and science of tool engineering and to encourage contributions in the immediate and in the related fields covered by the activities of the Society.

Citations appearing on the plaques and photographs of the gold medallions are featured on the next two pages.

ASTE Progress Award

presented to Ernest R. Breech

chairman of the board, Ford Motor Co.

Foremost manufacturing executive . . . with proved genius for integrating materials, methods, manpower, facilities, and human relations into over-all organization of highest efficiency . . . His foresight in analyzing demands of the future has greatly accelerated the advancement of automotive transportation.

As a key executive in organizing and directing the new management "team" at Ford Motor Co. since World War II, Mr. Breech tackled and accomplished a familiar mission—to achieve progress through modernization and expansion, with emphasis on greater efficiency and lower costs. He was elected chairman of the board in January, 1955.

He resigned as president of Bendix Aviation Corp. to join Ford as executive vice president in 1946. Previously, he had been a vice president of General Motors and president and later chairman of the board of North American Aviation, Inc., which in the early '30's operated Transcontinental and Western Air, Inc., Eastern Airlines and Western Air Express. At Ford, Mr. Breech is vice chairman of the executive committee, chairman of the administration committee, and a member of the committees on industrial relations, product planning, scheduling, merchandising, foreign operations and bank relations.

ASTE Gold Medal

presented to Fred H. Colvin

editor emeritus, *American Machinist*

Illustrious editor emeritus of a leading metalworking magazine . . . Author of a major engineering handbook and scores of textbooks and manuals covering most of the fields of metalworking . . . Active worker in the formation of published national standards

Grand old man of *American Machinist*, Mr. Colvin has been with the publication since 1907. He can tell you how the government made Springfield rifles in 1900, or how the flower boats look in floating gardens of Xochimilco. He's been over most of the metalworking world—and remembers what he's seen.

He was successively apprentice, toolmaker and tool designer, then associate editor and business manager of *Railway & Locomotive Engineer*. Progressively associate editor, managing editor, and editor emeritus of *American Machinist* since 1937, he's the man who recalls who made the Garvin lathe and the Blank screw machine 30 years ago.

Founder of the ASME screw-thread committee, he was with the Navy Bureau of Aeronautics during the war and a consultant at Oakridge on the atomic power project for a time thereafter. He is still active despite his eighty-plus years.

Joseph A. Siegel Memorial Award

presented to O. B. Jones,
president, Detroit College of Applied Science

Honorary Member . . . A prime founder and leading spirit in organizing the Society . . . Most sincere educator in development of young Tool Engineers . . . Unstinting contributor of his time, his abilities, and his personal means to the Society's progress.

Devotion to the ideals and goals that have guided the American Society of Tool Engineers since its earliest days has marked Mr. Jones as one of ASTE's most loyal supporters. An educator at heart, his technical knowledge combined with a true flair for teaching has been responsible for training a large group of today's prominent engineers.

His vision and guidance as a founder of the Society have been invaluable. He has served as a national director, and in 1939 was made an Honorary Member by action of the ASTE board of directors. Certainly the success of ASTE and the prestige enjoyed by tool engineers since its founding is a tribute to him.

Since establishing the Detroit College of Applied Science nearly 30 years ago, all of his efforts have been directed to the education of the young tool engineer. Students and fellow ASTE members alike hold him in highest esteem.

ASTE Engineering Citation

president, Kennametal, Inc.
presented to Philip M. McKenna

Society member . . . Renowned metallurgist, chemist and inventor . . . for original and important contributions to the development of carbide materials and tools, and their application in the machining and forming of manufacturing materials . . . able worker for the advancement of science and the public welfare.

Mr. McKenna is an internationally known engineer, metallurgist, scientist, monetary economist, crusader and philosopher. He is one of the fourth generation of a family that for almost a century has been prominent in metalworking industries—progressing from copper to brass, to carbon steels, to alloy steels, to hard sintered carbides.

Holder of nearly three dozen patents, he has been eminently successful in the development, application and promotion of distinctive types of tool materials originally conceived by him. In 1913, at 16, he invented and patented a method of separating nickel and cobalt. At 19 years of age, he patented the process of separating pure ferrotungsten.

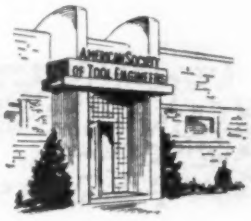
During the following years, he made over 10,000 intricate chemical experiments that culminated in the discovery of a new intermetallic substance—tungsten-titanium-carbide.

annual report *by the president*

The American Society of Tool Engineers has prospered because it has always recognized the needs of the profession and has taken forward steps to serve its membership. Keeping service to members foremost in all its plans, the Society provides for the interchange of information in the field of tool engineering, acknowledging the outstanding accomplishments that have contributed to our standards of living by making better industrial products to serve more of our people.

Even though ASTE is founded on worth-while objectives and has been successful, we cannot rest on our laurels. We must continue to supply virile leadership. We must always seek newer and better ways of disseminating useful information. Prestige of The TOOL ENGINEER MAGAZINE, *Tool Engineers Handbook, Annual Collected Papers*, research projects, scholarship awards, technical meetings and other services have contributed toward making the past year the fastest period of Society growth with respect to both the number of chapters chartered and number of new members.

The job of the future becomes one of maintaining effective leadership. This may be accomplished in



two ways: expanding present facilities and developing new activities as they affect tool engineering. Professional recognition is won by achievements. Public confidence must be maintained by groups such as ours, lest other interests impair or destroy the professional status of engineering.

Based on recent Society growth, it is conceivable that membership will double within the next ten years. This is supported by the fact that our future standards of living will be predicated on our industrial progress. This will demand more and more highly trained and skilled personnel, leaving more and more tasks to automatic operations that have been manual drudgery. Industrial growth will be increasingly greater in technical nature and will require higher output to meet the demands of an increased population.

Typical of the farsighted plans of the Society is the acquisition of a tract of land near Ann Arbor, Michigan. This area has great future potential from the standpoint of nearness to university facilities and industrial growth. Its proximity to the Phoenix Project and to transportation facilities will enable the Society to be ready for expansion and for the time when atomic energy for industrial power becomes a reality.

The following summaries of committee activities will indicate how the Society has progressed during the past year and how its policies have been implemented by service to the membership.

Financial: Although services for the membership are paramount, the existence of the Society and its ability to perform these services are dependent upon finances for operation. The financial position of the Society is favorable and should continue to provide increasing benefits to members.

The balance sheet for Jan. 31, 1955 included in this report shows our total assets as $1,266,857.57 and our net worth as $1,091,139.46. This is an increase in net worth of $310,470 during the past twelve months. To indicate the sources of income and the items of expense, the bar chart accompanying the balance sheet shows average amounts per year for each member, based upon the two previous fiscal years (1952-53 and 1953-54). Average membership during this period was 28,609 members. Although the average membership during the period of comparison is almost 4000 greater than the same average for the preceding two years, the income is

$9.42 greater than the expense per member. The comparative figure for the preceding two years was $3.96. These figures are computed on a two-year basis to include the Society's biennial Industrial Expositions.

Also included in this report is a chart showing the Society's growth since its organization in 1932. This chart shows the income, expenses and net worth for each year as well as the number of members during each year.

Membership: Today with a membership of 31,000, ASTE stands as one of the country's foremost engineering societies and is now rated among the largest. Our roster includes 125 chapters plus six student groups in the United States and Canada. Since April 1954, ten chapters have been chartered; namely, Kalamazoo No. 116, Battle Creek No. 117, Southeastern Massachusetts No. 118, Santa Ana Valley No. 119, Benton Harbor-St. Joseph No. 120, San Antonio No. 121, Riverside No. 122, Little Rock No. 123, Monadnock No. 124, and Oklahoma City No. 125.

During the calendar year of 1954, eleven new chapters were chartered. This is a new high in the number of chapters chartered during any one year since the formation of the Society. Also, within the past year, membership has been increased by more than 2600. Of this increase about 40 percent is the result of the formation of new chapters. The balance is from new members obtained in previously formed chapters.

Considerable interest is being shown by many groups desiring to organize new chapters. Some of the areas in which this organizational work is centered include Ashtabula, Ohio; East Texas area; Sidney, N. Y.; Jackson, Miss.; Ottawa, Canada; Emporium, Pa.; Trenton, N. J.

Professional Engineering: Aims of the National Professional Engineering Committee are to encourage and aid members interested in professional registration, consult with registration authorities who can make registration more available to tool engineers, and promote professional recognition of tool engineering and the Society among other engineers and the public. Although this is a relatively new project, most chapters have organized PE committees and a number of them have commendable programs to help members improve their professional status.

Suggested problems in the field of tool engineering have been submitted to state examining boards. Seven boards in leading industrial states have used some of these problems either verbatim or in formulating questions in examinations. To further aid chapters in setting up a program, the committee issues a monthly bulletin of information and suggestions. As an indication of increased interest in registration, there are now almost 1500 registered members, an increase of 17 percent during the past year.

Honor Awards: Four National Honor Awards will be presented for the first time at the Annual Meeting in Los Angeles. The awards are Joseph A. Siegel Memorial Award, ASTE Engineering Citation, ASTE Progress Award, and ASTE Gold Medal. These impressive awards will be presented to each recipient at the annual banquet. Recipients of these medals will be:

Mr. O. B. Jones, president, Detroit College of Applied Science, receives the Joseph A. Siegel Memorial Award for contributions through leadership, voluntary support or timely acts of benefit to the Society.

Mr. Philip McKenna, president, Kennametal, Inc., receives the ASTE Engineering Citation for unusual skill in the development of tool engineering principles.

Mr. Ernest Breech, chairman of the board, Ford Motor Co., receives the ASTE Progress Award for accomplishments in the field of manufacturing techniques or production methods.

AMERICAN SOCIETY OF TOOL ENGINEERS
BALANCE SHEET
JANUARY 31, 1955

ASSETS

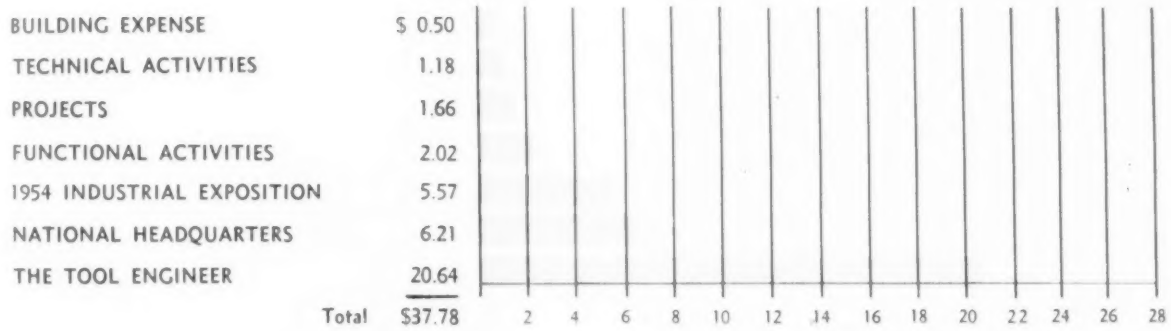
CURRENT ASSETS		
Cash on Hand and in Banks	$ 495,228.11	
Accounts Receivable	39,461.28	
United States and Canadian Bonds	458,460.00	
Inventories	40,449.23	
Total Current Assets		$1,033,598.62
FIXED ASSETS		
Land	$ 40,309.70	
Land Improvements	6,529.01	
Building	131,551.02	
Automobile	2,671.49	
Furniture and Fixtures	50,103.54	
Total Fixed Assets		$ 231,164.76
OTHER ASSETS		
Deposits with Others	$ 1,659.44	
Travel Advance	350.00	
Deferred Expense—Tool Show 1956	84.75	
Total Other Assets	$ 2,094.19	
Total Assets	1,266,857.57	

LIABILITIES AND NET WORTH

CURRENT LIABILITIES		
Accounts Payable Chapter	$ 8,819.04	
Accounts Payable Membership Pending	4,094.00	
Accounts Payable Trade	785.72	
Accounts Payable Suspense	313.50	
Accounts Payable Miscellaneous	5,562.10	
Accrued Agency Commissions	728.25	
Prepaid Advertising	10,214.66	
Awards Deposits	1,845.00	
Accounts Payable McGraw-Hill	495.44	
Accrued Federal Old Age Benefits	640.40	
Deposits—1955 Show Registration	6,750.00	
Deposits—1955 Show Space	135,470.00	
Total Current Liabilities		$ 175,718.11
NET WORTH		$1,091,139.46
Total Liabilities and Net Worth		$1,266,857.57

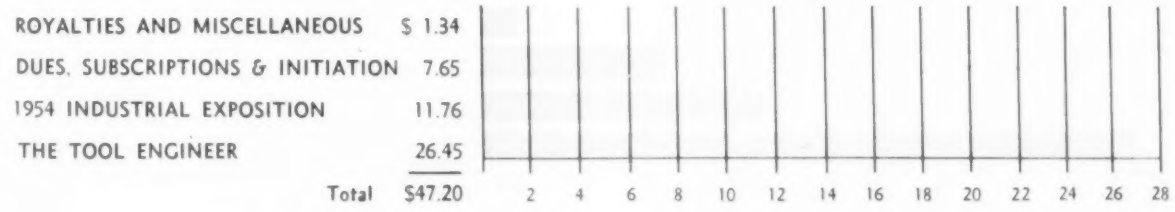
EXPENSES PER MEMBER PER YEAR

(Based on fiscal years 1952-53 and 1953-54)


BUILDING EXPENSE $ 0.50
TECHNICAL ACTIVITIES 1.18
PROJECTS 1.66
FUNCTIONAL ACTIVITIES 2.02
1954 INDUSTRIAL EXPOSITION 5.57
NATIONAL HEADQUARTERS 6.21
THE TOOL ENGINEER 20.64
Total $37.78
2 4 6 8 10 12 14 16 18 20 22 24 26 28

INCOME PER MEMBER PER YEAR

(Based on fiscal years 1952-53 and 1953-54)


ROYALTIES AND MISCELLANEOUS $ 1.34
DUES, SUBSCRIPTIONS & INITIATION 7.65
1954 INDUSTRIAL EXPOSITION 11.76
THE TOOL ENGINEER 26.45
Total $47.20
2 4 6 8 10 12 14 16 18 20 22 24 26 28

Average membership during period was 28,609

This bar chart for income and expense illustrates the multiple dividends received by each member in addition to invaluable technical information. With an average investment of $7.65, each member received services in various forms from the Society amounting to $37.78, a return of almost 500 percent of his investment in national operations.

In the balance sheet at the top of this page are shown the assets, liabilities and net worth of the Society. This portrays its strong financial structure, its net worth being more than $1 million dollars.

125 SOCIETY CHAPTERS SERVE

ASTE CHAPTERS

1. Detroit
2. Racine
3. Cleveland
4. Milwaukee
5. Chicago
6. Fairfield County
7. Hartford
8. Pittsburgh
9. Toledo
10. Buffalo-Niagara Frontier
11. Twin-Cities
12. Rockford
13. Baltimore
14. Northern New Jersey
15. Philadelphia
16. Rochester
17. St. Louis
18. Dayton
19. Syracuse
20. Schenectady
21. Cincinnati
22. Central Pennsylvania
23. Tri-Cities
24. Elmira
25. Worcester
26. Toronto
27. Los Angeles
28. Golden Gate
29. Houston
30. South Bend
31. Peoria
32. Springfield (Mass.)
33. Boston
34. Greater New York
35. Binghamton
36. Columbus
37. Indianapolis
38. Western Michigan
39. Seattle
40. Twin States
41. New Haven
42. Hamilton
43. Nashville
44. San Diego
45. Fond du Lac
46. Portland (Maine)
47. Akron
48. Potomac
49. Williamsport
50. Montreal
51. North Texas
52. Wichita
53. Little Rhody
54. Louisville
55. Windsor
56. Fort Wayne
57. Kansas City
58. Decatur
59. (Inactive)
60. New Orleans
61. Atlanta
62. Erie
63. Portland (Oregon)
64. Springfield (Illinois)
65. Niagara District
66. Richmond
67. Phoenix
68. Saginaw Valley
69. Pontiac
70. Muncie
71. Cedar Rapids
72. Fox River Valley
73. Evansville
74. Mid-Hudson
75. Madison
76. Springfield (Ohio)
77. Denver
78. Mohawk Valley
79. Waterloo Area
80. Des Moines
81. Grand River Valley
82. Piedmont

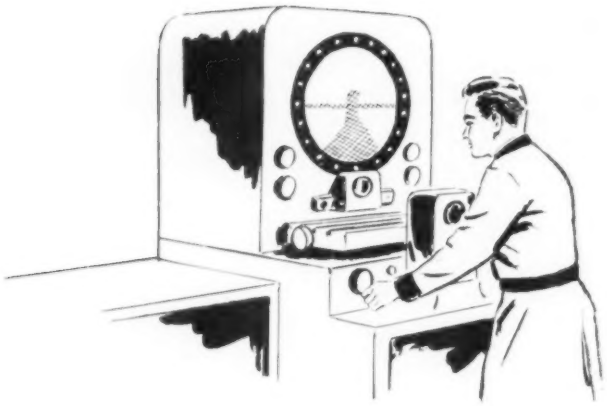
STRATEGIC INDUSTRIAL AREAS

Based on copyrighted map,
American Map Co., Inc.

83. Lehigh Valley
84. Long Beach
85. Salt Lake City
86. Granite State
87. Jackson
88. Long Island
89. Greater Lancaster
90. Tulsa
91. London-St. Thomas
92. Los Alamos
93. Albuquerque
94. Peterborough
95. San Gabriel Valley
96. La Crosse
97. Lima
98. Santa Clara Valley
99. San Fernando Valley
100. Northern Massachusetts
101. Keystone
102. Paterson
103. Nebraska
104. Louis Joliet
105. Memphis
106. Tucson
107. Knoxville-Oakridge
108. Chautauqua-Warren
109. Lansing
110. Canton
111. Muskegon
112. Calumet Area
113. Merrimack Valley Area
114. Hendrick-Hudson
115. Western Reserve
116. Kalamazoo
117. Battle Creek
118. Southeastern Massachusetts
119. Santa Ana Valley
120. Benton Harbor-St. Joseph
121. San Antonio
122. Riverside
123. Little Rock
124. Monadnock
125. Oklahoma City

STUDENT CHAPTERS

1. University of Michigan
2. Utah State College
3. University of Kansas
4. Wayne University
5. Alfred State Technical Institute
6. Purdue University



Mr. Fred H. Colvin, editor emeritus, *American Machinist*, receives the ASTE Gold Medal for outstanding service through published literature, technical writings or papers.

In addition, a Past Director's Award is being presented to every Past Director of the Society. Each Past Director of record has been notified of his award. To date about 15 percent have been awarded either through chapter presentation or by mail. Plans also are being formulated for two future awards, one for education and one for research.

Education: Interest in tool engineering is constantly increasing in colleges and universities. A recent survey of engineering colleges relative to the number of credit hours of tool engineering courses will be available for distribution to members and college deans. College level curricula, along with technical institute and apprentice training programs,

are being studied with the aim of making recommendations for keeping student courses abreast of current needs.

To support student interest and tool engineering courses in colleges, six student chapters have been chartered. They are: University of Michigan No. 1, Utah State No. 2, University of Kansas No. 3, Wayne University No. 4, Alfred State Tech No. 5, and Purdue University No. 6. Several other schools are being considered for potential student chapters. Studies are being made to ascertain if the courses offered at these schools in manufacturing, production or tool engineering are adequate.

On-Campus Conferences are being scheduled in increasing numbers. These conferences, held at colleges and sponsored by a group of Society chapters and the National Education Committee, not only provide engineering information for members but impress industry, the school and students with the importance of tool engineering. Eight conferences have been planned for the current school year and six are already proposed for the following year. The conference schedule includes meetings at University of Iowa, Lehigh University, University of Michigan, Purdue University, University of Houston, University of Tennessee, Massachusetts Institue of Technology, Michigan State College, San Jose State College, and University of Illinois.

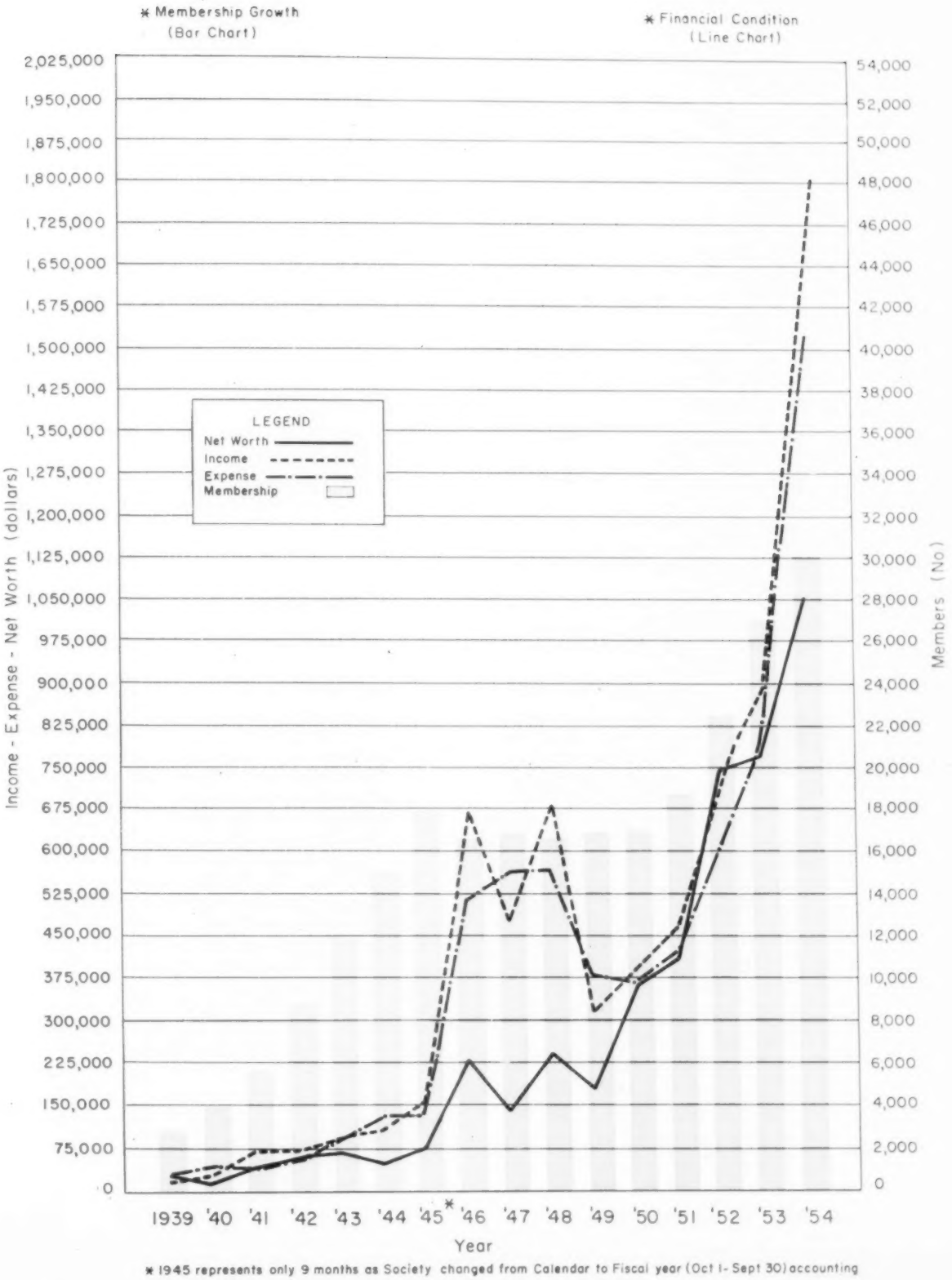
Industrial Expositions: The Society's first Western Industrial Exposition at Los Angeles brings a show to the West Coast that is patterned after our biennial Expositions which have been so helpful to tool engineers. Success for this Exposition has been assured by the participation of 275 exhibitors, showing and demonstrating their latest developments for improving production methods and processes.

At Philadelphia, in April 1954, the Industrial Exposition held in conjunction with the Society's Convention was an outstanding success and took its rightful place among the country's most outstanding shows. With nearly 500 exhibits to see, the thousands of ASTE visitors were aware it was the largest of our shows.

A total of 160,655 square feet was utilized at Philadelphia to exhibit the latest in cutting tools, machine tools and accessories, inspection equipment, presses and newest developments in workholding and other devices. Attendance figures placed the total registration for the show at 28,746. The theme "Tooling for Competition" keynoted the entire show as well as the many outstanding technical papers and conferences at the Convention.

SOCIETY GROWTH AT A GLANCE

1939-1954



* 1945 represents only 9 months as Society changed from Calendar to Fiscal year (Oct 1- Sept 30) accounting

Programs: Aiding chapters to plan their technical meetings and selecting papers for presentation at the Annual Meeting are major activities of the National Program Committee. Since publication of the Speakers' Directory in 1954, a total of 58 new speakers has been added to the directory. In anticipation of a complete new directory to be published later in 1955, these listings are furnished to each chapter in a supplemental sheet form. Also a new strip film program, "Process Analysis and Control" is available to all chapters as well as to colleges, in-plant training programs and other interested organizations. This film, together with the previous one entitled, "The Forces in Single-Point Tool Metal-Cutting," is expected to prove particularly valuable to chapters and other interested groups.

Scheduled for the Annual Meeting in Los Angeles, 40 outstanding authorities will present technical papers and participate in discussion conferences. For the first time at an annual meeting, participation by other societies is included. Two societies, namely, the Society for Quality Control and the Society of Plastics Engineers will participate by sponsoring sessions. The program content for this meeting was largely developed as a result of a survey in the area. Members also contributed suggestions and opinions leading to the adopted arrangement.

As part of a new program, approximately 150 sets of *ASTE Collected Papers* for the 22nd Annual Meeting have been distributed to colleges and institutes. Because of the favorable reaction, this type of distribution will become an important contribution by the Society to industry and education.

Editorial: Policies and performance of THE TOOL ENGINEER magazine are the responsibility of the National Editorial Committee. The noteworthy increase in the number of advertisers in the magazine has enabled the editorial section to expand and provide more information in the various fields of member interest. During the year (April to March), the average number of pages per issue was 316. For the same period of the previous year, the average was 276 or an increase of almost 15 percent. The April issue, which was the Exposition and Convention issue, was the largest published by the Society. It contains 538 pages. The March issue is also a special issue featuring the Western Industrial Exposition and Convention. It contains 402 pages.

In the past 12 months, 39 technical articles and 30 "Gadget" articles were authored by ASTE members. This satisfactory trend has been enhanced by the active participation of Field Editors. Now numbering 64 members, they inform the editor of newsworthy developments or subjects for technical articles which arise in their localities. The caliber of our technical articles is indicated by the fact that 38 articles have been reprinted in quantities up to 5000 during the past candendar year. Some of our largest manufacturers have requested this service.

In the ASTE news section, feature articles have dramatized many of the important ASTE national events and projects. In addition, reports on meetings keep the membership informed on chapter activities. All chapters are contacted regularly in an effort to stimulate the flow of these news reports. A total of 649 news reports was submitted from 117 chapters during the year.

Comparison between THE TOOL ENGINEER magazine of several years ago and the present magazine will show how far we have progressed toward our goal of being the accepted leader in our field. The colorful, eye arresting covers, large clear illustrations, judicious use of color and carefully planned layout are a few of the mechanical improvements immediately apparent. The meticulous care evidenced in the selection and editing of material has produced a magazine of which the Society may be justly proud.

Books: Work of the group of specialists who so ably fulfilled their manifold responsibilities in the production of the *Die Design Handbook* has now been concluded with the exception of a few closing details. Despite hopes that the handbook would be published and on display at the Annual Meeting at Los Angeles, copies will not be off the press until April or May at the earliest.

A list of experts in all phases of tool engineering is being continuously built at headquarters from which group chairmen are being selected for the task of revising the *Tool Engineers Handbook*. The list now includes some 100 acceptances to help in the revision and, together with invitations to other capable men, forms a competent author-reviewer pool.

The National Book Committee stands ready at all times to receive and review manuscripts on tool engineering subjects.

Standards: Currently, a program is being sponsored among chapter standards committees wherein ASA standards are being reviewed from the viewpoint of the tool engineer. Progress reports indi-

ate that the results will be useful in implementing and revising these standards.

To formulate a classification system for tool steels, a special committee has been formed by the National Standards Committee. Membership of this subcommittee includes a good cross section of tool steel producers and users. Scope of operations has been outlined and existing material has been reviewed.

ASTE is the administrative sponsor for two ASA committees, industrial diamonds and accessories for their use (B-67) and classification of materials for tools, dies and fixtures (B-52). Besides sponsoring these two committees, the Society is represented on

The American Standards Association's Standards Council and Mechanical Standards Board and provides representation on eight other ASA sectional committees.

The new "package" system of ASTE Data Sheet service is proving to be successful. In addition to the recently published *Drill Unit Data Sheet* package, six other subjects will be treated similarly during the calendar year. These will include drill jig bushings, chucks, valves, die sets, collets, and punches and dies.

Research: The first year of full operation of the ASTE Research Fund Committee has been one of planning, action and results. Forty proposals have been received for projects. These have come mainly from research laboratories, universities or research workers desiring sponsorship for the work. Three have been suggested by ASTE members and six have come from industrial sources.

Contracts for three projects have been let. They include: "Temperature Rise in Metals" wherein use of an analogue computer will be investigated in determining temperature distribution in a workpiece. "Application of Cutting Fluids" involves study of the many variables of mist application. "Borides as a Cutting Tool Material" consists of studies to determine material suitability as a substitute for carbides.

A fourth project has been accepted for sponsorship but no contracts have been let. This "Metal-Cutting Project" is the most important and most ambitious of our projects. The Research Fund is attempting to provide leadership for a nation-wide attack on this basic problem. It will require the combined efforts of many organizations and many laboratories.

Each project is guided by a steering committee composed of recognized authorities in the field of each project. Each committee meets regularly to discuss progress and results of the research. Response of industry, large and small, to requests for services of their top engineers and scientists has been gratifying. Monetary support of industry for the program has started. The Research Fund Committee is looking forward to greatly increased activity and to more participation by industry in its program.

Constitution and By-Laws: Any organization requires proper guidance and intelligent procedures in carrying out its many and varied activities. The Constitution and By-Laws Committee continually studies these so that conflicts and overlapping of responsibilities are reduced to a minimum. The committee must of necessity be ever alert to meet changing conditions, requiring varying approaches to the problems of today. The Committee stands ready to interpret the Constitution with respect to specific problems that may arise. It also reviews the procedures and implements them, both for the national and chapter organizations. Presently, the Committee is engaged in studying proposed revisions for the Constitution and By-Laws.

Public Relations: Keeping the public advised as to the Society's progress is the important assignment of the National Public Relations Committee. With the aid of professional consultants and chapter committees, highly satisfactory results have been obtained. Also, an improved program is being developed to utilize more methods for promoting the Society's interests. The increasing recognition being gained by the Society is due in a large measure to the work of those who are informing the public of the Society's progress and good work.

Conclusion: Progress made by ASTE during the past year has been extremely gratifying. The achievements summarized briefly in this report are indicative of the vigorous nature of the Society. Plans now being studied and implemented will assure continued growth and even greater accomplishments. The Board of Directors acknowledges the Society's debt to the many national and chapter officers, committee members and all others who contributed time and talent to build a greater Society that it may better serve its members, industry and the public.

Submitted for and on behalf of the
Board of Directors and National Officers

Joseph P. Cooley

President and Chairman of the Board

Little Rock Chartered

An inspirational message was offered the new chapter by Harold E. Collins, third vice president of ASTE for 1954-55 and chartering officer.

Along with being the first ASTE chapter to be chartered in 1955, Little Rock also established another "first" by having the ceremonies filmed for showing on television. The films were shown on a local newscast at 10:30 p.m., Jan. 5, the same day of chartering.

Among special guests at the charter meeting, held at the Sam Peck Hotel, was Pratt Remmel, mayor of Little Rock.

Chartering officer was Harold E. Collins, 1954-55 national third vice president and a national director. Assisting him were: Irving H. Buck, area captain of the National Membership Committee; and Marvin J. Bunting, staff administrator from National ASTE Headquarters.

Officers of the 123rd chapter were elected at the meeting and installed by Mr. Collins. They are: chairman—Bert C. Foster, master machanic at Redmond Co., Inc., Jacksonville, Ark., first vice chairman—Ross E. Quinlan, project engineer, U. S. Time Corp., Little Rock; second vice chairman—Denton G. Lama, partner, Arkansas Tool & Die, North Little Rock; secretary—James C. Robertson, tool engineer, U. S. Time Corp., Little Rock; and treasurer—George W. Spruce, president, Central Cast Stone, Little Rock.

Officers of the Little Rock chapter pose for their first official picture. They are, from left: Bert C. Foster, chapter chairman; Ross Quinlan, first vice chairman; Denton G. Lama, second vice chairman; James C. Robertson, secretary, and George W. Spruce, treasurer.

Pratt Remmel, mayor of Little Rock, conveys his best wishes to the members of the chapter for continued success in their endeavors.

Joseph P. Crosby, 1954-55 national ASTE president, presents the charter to Karl Anderson, student chapter chairman. From left are: Carl J. Oxford, Jr., of the National Education Committee; William H. Smila, past president of ASTE; Karl Anderson; Mr. Crosby; Dr. A. R. Carr, dean of engineering, Wayne University; and Stanley Phillips, retiring chairman of the Detroit chapter.

Wayne University student chapter

Chartering of the Wayne University student chapter in Detroit was a happy occasion for members of the senior Motor-City chapter who had worked diligently helping to organize it. Located in the Society's birthplace and at the site of the first and largest chapter, Wayne University was the fourth chapter to receive a student charter from ASTE.

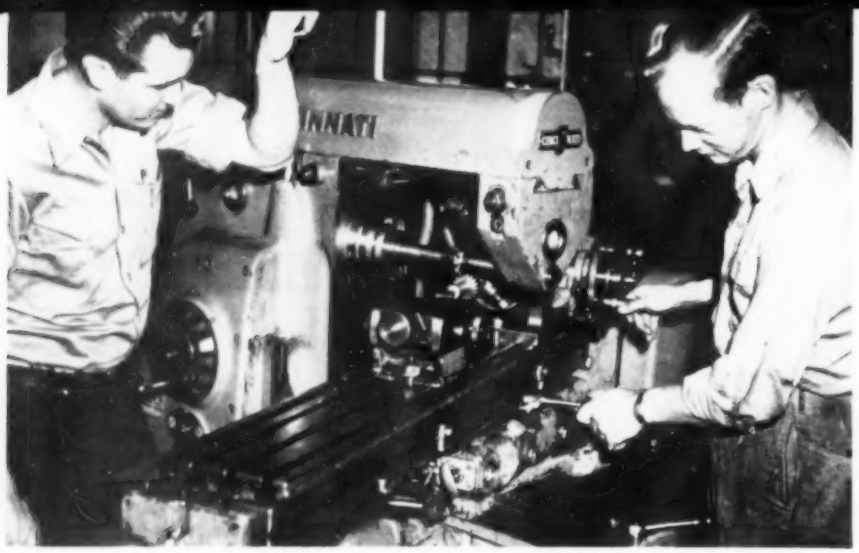
Joseph P. Crosby, 1954-55 national president of ASTE, presented the charter on behalf of ASTE in ceremonies at the Student Center on Feb. 17. Harry E. Conrad, executive secretary of the Society was toastmaster. Among other ASTE notables present were: William H. Smila, past president of ASTE; Charlie Smillie, a national director of ASTE for 1954-55; Stanley C. Phillips, retiring chairman of the Detroit chapter; and Carl J. Oxford, member of the National Education Committee and of the Detroit chapter.

Principal speaker on the program was Dr. A. R. Carr, dean of engineering at Wayne, who spoke on "The Future of Tool Engineering at Wayne University."

One of the program highlights was the presentation of an aluminum gavel to the newly elected chairman, Karl Anderson, on behalf of the Little Rock chapter, chartered the previous month. Mined, machined and manufactured in Arkansas, and inscribed with the chapter name, it was accompanied by a welcoming letter from Bert C. Foster, chairman of the Little Rock chapter.

At the head table are: Rev. Theodore Daniels, who gave the invocation; Dr. A. R. Carr; Joseph P. Crosby; Harry E. Conrad, executive secretary of ASTE; and Karl Anderson.

Student chapter officers pose with Wayne engineering faculty members. Faculty members, seated, from left, are: George Demarest; Wesley Churchill, student chapter faculty advisor; Dean Carr; Gordon Rivers; and Dr. Spencer Larsen. Standing are student officers: Richard Roy, first vice chairman; Roger DeMumbrum, second vice chairman; Roy Dunbar, treasurer; Karl Anderson, chairman; and Louis Orosz, secretary.



Demonstrations of university engineering facilities are an important phase of an on-campus conference program. Here, a gear cutting operation is shown in University of Tennessee's machine shop in Estabrook Hall.

Five On-Campus Conferences Scheduled

On-campus conferences are fast becoming a traditional phase of ASTE spring and fall activity. This spring during the months of April and May, five such conferences have been scheduled.

In April all activity is concentrated on one week end. Purdue University's third annual conference is slated for April 23, and the University of Houston will hold its first on-campus conference, a two-day event, on April 22-23.

During the first week of May, two more educational centers will hold their initial ASTE conferences. The Massachusetts Institute of Technology will hold a one-day program on May 7, and the University of Tennessee plans a two-day conference for May 6-7.

On the following week end, May 15, a conference will be held on the campus of Michigan State College. More complete programs on the May conferences are scheduled to appear in the News Section in the May issue of THE TOOL ENGINEER.

Purdue University

Michael Golden Engineering Laboratories at Purdue University, West Lafayette, Ind., will be the scene of an on-campus conference on April 23. Sponsored by the School of Mechanical Engineering in cooperation with the Indiana Council of ASTE, the National ASTE Education Committee and the Division of Adult Education, the conference will have as its theme "Tooling and Production."

Registration for the Saturday program is from 7:15 to 8:15 a.m. Special tooling demonstrations are scheduled in the Machine Tool Laboratory from 8:15 to 10 a.m. and will be aided by closed circuit television.

Demonstrations will include: principles of hydroforming, hard material machining, duplicate turning, tracer lathe tooled for production, power and tool force measurements, temperature measurements and machine tool lab classes in operation.

At 10 a.m. a general session begins in Room 101 of the Michael Golden Laboratories. Welcome greetings will be offered by Dr. George A. Hawkins, dean of the Schools of Engineering, Purdue. "Wide Awake Communications" will be the subject of a talk by P. E. Lull, professor of speech at Purdue.

A highlight of the morning session will be a four-man panel discussion on "Plastics in Tooling." Panelists will be R. M. Houghton, president of Houghton Laboratories, on "Plastic Dies in Metal Fabrication;" Lewis F. Bogart of Marblette Corp., on "The Use of Plastics in Chrysler Body Engineering;" W. R. Weaver of Modern Pattern and Plastics, Inc., on "Short Run Plastic Die Developments;" and W. A. Fletcher, chief process engineer, Delco-Remy Div. of General Motors Corp., on "High Speed Carbide Dies on Laminations."

Halsey F. Owen, professor of manufacturing processes, Purdue; Carl A. Darger, chairman of the Muncie chapter; and Joe Enright, chairman of the Indianapolis chapter, will reside at different portions of this morning session.

The luncheon, to be held in the South Ballroom of the Memorial Union, will be presided over by

Paul W. Vierling. Toastmaster will be Joseph P. Crosby, 1954-55 national ASTE president; and Dr. F. L. Hovde, president of Purdue, will deliver a welcoming address.

The afternoon session will feature another panel discussion on "Cold Forming Processes." Panel members include: K. W. Moore of the Processes Machinery Div. of Cincinnati Milling Machine Co. on "Hydrospin;" D. I. Brown, market development manager of the Koldflo Div. of Mullins Manufacturing Corp., on "Mullins' Koldflo;" James S. Solomon, chief engineer, The National Machinery Co. on "Cold Heading and Cold Extrusion;" and H. Pelphrey, research engineer, Michigan Tool Co., on "Spline Forming." Jerome Krumpelman, first vice chairman of Louisville chapter, will preside at this session.

A six o'clock dinner will have Howard C. McMillen, second vice president of ASTE for 1954-55, acting as toastmaster. Harold I. Housewerth, chairman of the South Bend chapter will preside, and the guest speaker will be W. H. Johnston, associate professor of chemistry at Purdue. His subject will be "Everyday Radioisotopes."

Wives of the conferees will have their own program. Laboratory participation for all those interested in enameling on metal will be held in the North Shops of the Michael Golden Laboratories starting at 8:15 in the morning.

Chairman of the conference is O. D. Lascoe, professor of manufacturing processes at Purdue.

Ezekiel Cullen Building houses the administration offices of the University of Houston.

University of Houston

The theme of the conference to be held at the University of Houston, in Houston, Texas, on April 22-23, is "Increased Profit Through Increased Production." Sponsored by the University and the Houston chapter, the conference will be held in the Engineering Building on the campus.

Registration is Friday from 12:30-2 p.m. in the lobby of Cullen Auditorium. The afternoon session begins at 2 o'clock, opening with greetings extended by General A. D. Bruce, president of the University of Houston. Malcolm F. Judkins will then take over with his presentation on "Design and Application of Carbide Cutting Tools," until 4 p.m. Mr. Judkins is manager of New Products, Firth Sterling Co. Moderator for the session is J. T. Elrod.

A 6 o'clock dinner in Oberholtzer Hall rounds out the first day's program. H. Dale Long, assistant secretary-treasurer of ASTE for 1954-55 and president of Scully-Jones & Co., is guest speaker. His topic will be "Some Practical Ways to Increase Profit." The toastmaster will be Otis Traughber.

On Saturday a coffee hour and tours of the engineering laboratories and facilities will take up the fore part of the morning. The morning technical session beginning at 10 a.m. will feature two speakers. S. A. Brandenburg, vice president of sales, Monarch Machine Tool Co., will talk on "Functional Design Requirements of Machine Tools." "Electronics for Machine Tools" will be discussed by W. F. Strong, of General Electric Co. Moderator of this session is L. J. Castellanos.

A 12:30 luncheon will wind up the conference with D. H. Apgar, project engineer for International Business Machines Corp. presenting the paper "Electronic Controls by Digital Techniques." Presiding at the luncheon will be M. L. Begeman, chairman of the mechanical engineering department, and a member of the National Education Committee.

Serving on the conference program committee are M. L. Ray, Dean of Engineering at the University; Homer Briggs, chairman of the Houston chapter education committee; Thomas Elrod; L. J. Castellanos; E. C. Hailey; D. G. Williams; and C. R. Gamble—all members of the University of Houston School of Engineering faculty.

Massachusetts Institute of Technology

The first ASTE on-campus conference to be held in the New England area will take place at the Massachusetts Institute of Technology in Cambridge, Mass., on May 7. Conferees can register from 8:30 until 11:30 in Lobby Building 10. All technical sessions will be held in Room 10-250 of Huntington Hall.

The morning session beginning at 9:30 will feature three speakers. Prescott a Smith, associate professor of mechanical engineering, MIT, will discuss "Instrumentation for Metal-Cutting Research." "Tool Life and Machinability" will be the topic of Milton C. Shaw, professor of mechanical engineering and in charge of the Division of Metals Processing, MIT. Nathan A. Cook, associate professor of mechanical engineering, MIT, will speak on "Principles of Grinding."

continued on next page

FORT WAYNE—Ernest Pawley, representative from the Ultrasonic Div. of Sheffield Corp., is welcomed to the Jan. 12 meeting of Fort Wayne chapter by Josef A. Deck, first vice chairman.

LONG BEACH—Some 125 members of the Long Beach chapter witnessed a program on the Pan-American Road Race. Bill Stroppe, center, "king of the western sports car racing world," was guest speaker. With him are C. B. Edson, right, chairman; and J. H. Medford, program chairman.—*C. W. Ward*

SAGINAW VALLEY—Products ranging from spark plugs to large and complicated machine tools will be exhibited at Saginaw Valley's Product Show in April. Here, looking over a valve assembly machine, are A. W. Blackmon, national delegate; and Howard Roat.

On-Campus Conference Programs

(Continued from preceding page)

After a noon luncheon in Walker Memorial, visitors will view the Metals Processing Laboratory and Digitally Controlled Milling Machine.

The last session on the day's agenda will highlight two speakers, Charles Clark of Cincinnati Milling Machine Co. will present a talk on "Economics of Equipment Replacement"; and L. D. Miles of General Electric Co. will speak on "Value Analysis." For further information about the conference, write to: Karl Nowak of Fenwal, Inc., Ashland, Mass.

University of Tennessee

The University of Tennessee in Knoxville, Tenn., has scheduled its first ASTE conference on May 6-7, sponsored by the Knoxville-Oakridge and Atlanta chapters of ASTE and the East Tennessee section of ASME. To be called "The Metal Processing Conference," the two-day program will take place in the Moot Court Room of the Law Building.

Tentative plans list a Friday morning session devoted to the general theme of "Casting and Die Casting," followed by luncheon and an opportunity to see engineering facilities on the campus.

During Friday afternoon a session will be held on "The Latest Developments in the Field of Metal-Cutting Research." A banquet will conclude the Friday program.

Saturday morning a production discussion along the general topics of Pressworking of Metals and Drilling and Tapping will wind up the conference ending at noon.

For further information regarding conference, write to: Roy Center, Coordinator of Conferences, Division of Extension, Perkins Hall, University of Tennessee.

Michigan State College

Taking their cue from a highly successful event in May 1954, Lansing and the central Michigan chapters, in cooperation with Michigan State College School of Engineering and the National ASTE Education Committee, are proceeding with plans for another on-campus conference on May 14. The program will develop the theme "The Tool Engineer Meets the Product Engineer."

The conference, occurring during the centennial celebration of MSC, culminates a week during which special attention is focused on the School of Engineering. An invitation has been extended all ASTE members by the MSC School of Engineering to visit the displays and exhibits comprising the Engineering Exposition.

A further invitation has been extended, for those who can, to come one day early on Friday, May 13, and attend the centennial symposium entitled "Automation—Engineering for Tomorrow." Automation developments in eight separate engineering fields will be discussed. For information on the conference, write: Keith B. Odle, Continuing Education Service, Kellogg Center, Michigan State College, East Lansing, Mich.

Saginaw Valley Plans Product Exposition

Commemorating the tenth anniversary of the chartering of Saginaw Valley chapter, a Product Show will be held in April at the I.M.A. Auditorium in Flint, Mich. Michael Skunda, the chapter's first chairman, is heading the organization in charge of the three-day event which opens on April 1.

Theme of the show is "The Tool Engineer in Industry." The exhibition is open only to industries located in Saginaw Valley. Since the venture is new in the area and is being given as a nonprofit public service, it has received wide industrial, business and civic support.

Several branches of the government have offered their services which will be available during the exhibition.

Opening the show will be a special dinner on April 1 at the Durant Hotel. Reservations are limited to 400.

The exhibition 'show book' is being edited by Robert Irvin and will find feature activities of the Society in all of its different phases. —*Robert Irvin*

New Officers Chosen at Portland, Me., Meeting

Heading the 1955-56 slate of officers for Portland, Me., chapter is James A. Comeau, newly elected chairman. Serving with him are: Ross L. Beaubieu, first vice chairman; Herbert Ridlow, second vice chairman; Stanley Hyde, secretary; Henry C. Hagman; and Eldon L. Wishart, national delegate.

The election meeting program was presented by E. E. Oathout, product engineer, Behr-Manning Corp.

—*Henry C. Hagman*

CHICAGO—Officers of the Windy City chapter are, from left: Louis Vargo, treasurer; Harold Erickson, third vice chairman; O. J. Onken, chairman; Richard Miller, first vice chairman; and W. Egon.

LONDON-ST. THOMAS—The new slate of officers for the London-St. Thomas chapter includes: from left, F. W. Lewis, delegate; John Fowlie, secretary; William Lyon, first vice chairman; Roy Brown, chairman; Charles Stevenson, second vice chairman; and Wilfred McKee, third vice chairman. L. Allingham, treasurer, was not present for the picture.

SPRINGFIELD, MASS.—New chapter officers, from left, are: Hollis B. Moore, chairman; Kenneth R. Blaisdell, first vice chairman; Robert W. Marquiss, second vice chairman; Karl F. Kuralt, treasurer; and George H. Foy, secretary. The speaker election night was John L. Schwab, president of John L. Schwab Associates, who talked on the future of tool engineering.—*George H. Foy*

Pardon Our Pride!

Thanks to the outstanding work of ASTE's chapter editorial chairmen, THE TOOL ENGINEER for April breaks all records for chapter news reports. For the first time in Society history, 101 reports are published in a single issue of the magazine! This is an increase of more than 32 per cent over the previous record.

All credit for this tremendous achievement is due the editorial chairmen from the 100 chapters listed on page 124. Congratulations to all of you!

Because of the large volume of news, "Coming Meetings" does not appear in this issue. Also, in order to insure space for all chapters reporting, a certain amount of cutting of news articles has been necessary.

Golden Gate Elects 1955-56 Officers

Election of the officers who will direct activities of the Golden Gate chapter for the coming year was held Feb. 16 at Bellini's Italian Restaurant. New officers are: chairman—Ted N. Lindquist; first vice chairman—Hans Metz; second vice chairman—Jack Geisendanner; secretary—Philip R. Freeman; treasurer—William G. Burge; national delegate—Ten Lindquist; and alternate delegate—L. Dean Roulund.

Technical speaker on the evening program was Henry L. Strauss, Jr., technical director of National Diamond Laboratory. His subject was "Industrial Diamonds in Tool Engineering."

Ben J. Hazewinkel, a national director of ASTE for 1954-55; and Andy Rylander were special guests at the meeting. —*Ernest H. Romine*

Chicagoans Hear Otto W. Winter

Otto W. Winter was the guest technical speaker at the Feb. 7 meeting of the Chicago chapter. Mr. Winter, manager of the Shell Mold Div. of Beardsley & Piper, discussed "Shell Molding" for an audience of 150 at the Keymens Club. Another highlight of the program was a color film, shown by John Beck, retiring chairman, of his trip to the Austrian Alps.

On Feb. 18 the chapter toured Foote Bros. Gear and Machine Co. which currently makes precision gears and gear motor assemblies. Approximately 60 made the tour. —*R. C. Berliner*

Chem-Milling Topic of Baltimore Meeting

The Engineers Club was the scene of Baltimore chapter's Feb. 2 meeting at which members and guests, numbering 150, heard a technical talk on "The Chem-Milling Process." Speaker was Archie K. Beard, eastern district manager of the Chem-Mill Div. and also manager of the Metal Processing Div. of Turco Products, Inc. Mr. Beard showed a colored film illustrating the samples of work produced by Chem-Milling, an etching process involving masking of portions which are not to be eroded which is effective on aluminum, titanium alloy and stainless steel.

The coffee speaker was Dr. Harry B. Osborn, Jr., 1954-55 first vice president of ASTE, who commented on the Society's position nationally.

The evening was in honor of past chairman of the Baltimore chapter and Dr. Osborn introduced Stanley S. Johns, chairman 1939-40; G. F. Steiner, chairman 1941-42-43; C. Irwin Hochhaus, chairman 1945-46; W. Daryl Winger, chairman 1946-47; Thomas F. Burke, chairman 1947-48; Andrew Jones, chairman 1949-50; Robert D. Brickett, chairman 1950-51; Leon Laux, chairman 1952-53; and Donald Wernz, chairman 1953-54. —*Neil Heller*

BALTIMORE—Newly elected officers of the Baltimore chapter for 1955-56 are: front row, from left, Richard W. Coleman, 1954-55 chairman; George A. Andrews, treasurer; Anthony Taormina, secretary; and Dr. Harry B. Osbon, Jr., national first vice president. In the second row are: Donald E. Wernz, national delegate; Robert S. Smith, second vice chairman; Roy Pajarinen, first vice chairman; and LeRoy Rubright, chairman-elect.—*Neil Heller and Donald Wernz*

Madison ASTE Chapter Holds Membership Night

A highly gratifying attendance was on hand Jan. 20 for Madison chapter's 100% membership night. While the 100% goal wasn't met, nevertheless the turnout was an excellent one and the evening was a success.

The chapter's first scholarship award was given to Philip Reed, an outstanding engineering student at the University of Wisconsin. The program also included talks on methods of coated abrasive application by H. W. Kruse and R. K. Grinden of Minnesota Minning Co. —*Lyding Havey*

MADISON—Recipient of the chapter's first scholarship award is Phillip Reed, second from left, engineering student at the University of Wisconsin. Extending the good wishes of the ASTE membership is Jack Murray, 1954-55 chairman. The award was presented by Robert Marshall, far left, association dean of the university's college of engineering. At the far right is Roy Lindberg, instructor in mechanical engineering at the college. Mr. Reed was chosen for his outstanding work, ability and technique in the field of tool engineering.

Seattle Chapter Hears Tooling Research Expert

True stress and true strain as applied to problems of forming some of the new metals was the subject of Seattle's technical session held Jan. 25 at the Town & Country Club.

The speaker was William Anderson of the experimental tooling research unit at Boeing Airplane Co. His studies of the newer metals under various load conditions have been an influencing factor in process determination.

—*H. F. Hanson*

BOSTON—One hundred and fifty members of the Boston chapter met at the New England Mutual Hall on Feb. 10 to elect these men as their 1955-56 leaders. From left are: Charles L. Sadon, chairman; Thomas B. Walsh, first vice chairman; Frank D. Clark, second vice chairman; Robert E. Dean, treasurer; Ernest J. Druan, Jr., secretary; and Karl G. Nowak, delegate. The technical program featured a presentation by L. Paul McMenimen and Frank Cronin of the New England Telephone and Telegraph Co. on transitors.—*Evo P. Castelli*

Two Speakers on Twin Cities Program

About 85 members of Twin Cities chapter met Feb. 2 for technical talks by two industrial speakers. They heard about "The Crush True Story" from Edgar Hakanson of Sheffield Corp. and about "Files on Parade" in a film showed by Jack Haas of Heller File Co. Mr. Hakanson explained the advantages of crush dressing vitrified grinding wheels. Mr. Haas pointed out the many mistakes often made in ordering files, even among the best qualified engineers.

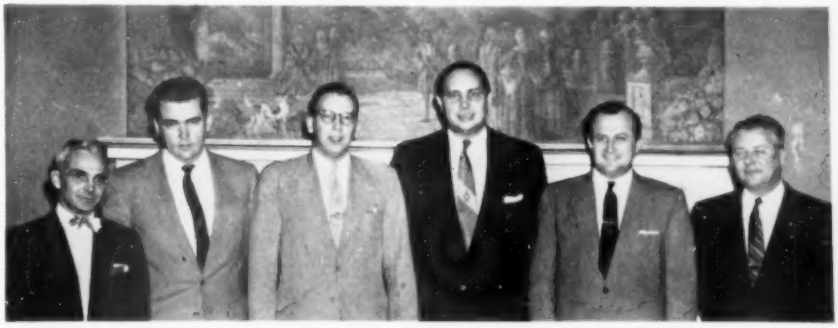
—Walter J. Comstock

TWIN CITIES—New officers for the coming year, from left, are: Jerome W. Schwartz, national delegate; Arnold Lidfors, secretary; Robert M. Johnson, chairman; Norman Sorlie, second vice chairman; Philmore W. Armstrong; Peter Tobias, alternate delegate; and Walter J. Comstock, treasurer.

Dayton Makes Annual Plant Tour in January

The Dayton chapter's annual plant visitation which the ladies were invited to attend was held this year at the Moraine plants of Frigidaire Div. of General Motors Corp. Some 150 members and their wives made the tour. The trip started with a general meeting at the Moraine City Auditorium at which time the crowd was split into smaller groups and guides assigned. The guides each pushed two-wheeled carts containing full public address equipment so it was easy to follow the comments. A cafeteria dinner followed the tour.

—W. J. Killinger



DAYTON—Members of the Dayton chapter elected 1955-56 officers at Sutmiller's Restaurant on Feb. 14. New officers are: Roy J. Dusseau, 1954-55 chairman and present national delegate; Jack Copeland, treasurer; George Brandt, Jr., secretary; Victor J. Boll, chairman; Francis J. Heberling, first vice chairman; and Warren L. Braun, second vice chairman. The meeting was rounded out by a technical program. Hale Cadieux, special representative of the Bellows Co., discussed various types of air devices. The movie "Operation Push-Button" was also shown.

Party Highlights St. Louis Schedule

Winter meetings of the St. Louis chapter were punctuated with a social evening on Dec. 18 when members and their guests held a holiday party at the Chase Hotel. The Starlit Roof was the setting for the dinner dance. Gifts were presented to all ladies present by the ASTE Santa Claus.

On Dec. 2 the chapter met to hear a talk on "Ultrasonic Machining of Hard Materials." Speaker was E. Pauley of Sheffield Corp.

—Bert S. Igou

ST. LOUIS—At its annual joint meeting with ASM, the St. Louis ASTE chapter heard a discussion on broaching by James Dopp, seated, center, of Lapointe Machine Tool Co. Shown with the guest speaker, also seated, are Irwin J. Schumaier, ASTE chairman, and George A. Fisher, Jr., ASM chairman. Standing: R. D. Bardes and Julius Turk of ASME; and H. N. Zimmerman and Clarence Hall of ASTE.

Little Rock Chapter Hears J. A. Warren

At its first meeting since chartering, Little Rock chapter met at Hank's Dog House to hear J. A. Warren, sales engineer for the Cincinnati Shaper Co. More than 50 members were present. Mr. Warren gave an informative lecture on the history and versatility of press brakes. He augmented his talk with slides.

—R. A. McKinstry, Jr.

Twin States Sponsors Refresher Course

In cooperation with the Vermont State Department of Education, the Twin States chapter is presenting a two-year course to help tool engineers prepare for state registration examinations.

Dave Armstrong, chairman of the chapter's professional engineering committee, is in charge of the course. George Julien, member of the Professional Engineering Committee, has assisted him. Current instructors are: Paul Brooks, E. H. Otis, Warren Crocker and Bob Evans.

A total of 81 persons is taking the course. When all of the classwork has been completed, they will have covered classes in mathematics, physics, applied mechanics, electricity, metallurgy, inorganic chemistry, thermodynamics, strength of materials, fluid mechanics, mechanics of machines and engineering economics.

—Lee M. Davis

TWIN STATES—Serious concentration, with an eye to becoming registered professional engineers, marks the faces of this group of men at a class offered as part of the two-year refresher course by Twin States chapter in cooperation with the Vermont State Department of Education. Among those pictured are: Lee Davis, Kenneth Van Oertzen, Fiesco Ingalls, Douglas Handy, Floyd MacArthur, Ray Streeter and Paul Gates.

Joseph Strite New Grand River Chairman

After the ballots were counted at the Feb. 4 meeting of the Grand River Valley chapter, Joseph Strite was chairman. His new fellow officers include: Clayton K. Henderson, first vice chairman; Gilbert Dilly, second vice chairman; Percy Bowman, third vice chairman; Roy Robertson, secretary; Grant Johnstone, treasurer; and Percy Barber, national delegate.

E. O. Clark, manager of industrial sales for Vickers Inc., was the guest technical speaker. He chose as his topic "Hydraulics in Industry."

—W. C. Little

New Orleans Speaker Talks on Tool Steels

L. V. Klaybor of Allegheny Ludlum Steel Corp. was the featured speaker at a recent meeting of New Orleans ASTE members. His subject concerned tool steels and their application. A question and answer period followed the discussion. Mr. Klaybor is association director of research for Allegheny's Tool and Die Division.

—J. Natal

Massachusetts Members Hear E. V. Hellyar

The Jan. meeting of the Southeastern Massachusetts chapter featured a discussion on "The Plastics Industry Today." Program speaker was E. V. Hellyar, assistant sales manager of Monsanto Chemical Co. Nearly 100 members and guests attended the session.

—Karl W. Nittel

Racine Members Visit Scully-Jones & Co.

A trip to Chicago to visit the Scully-Jones plant was on the Feb. 9 agenda for the Racine chapter. Members were welcomed by H. Dale Long, president of the company and 1954-55 assistant secretary-treasurer of ASTE.

The two-hour tour, in which all phases of manufacturing of Scully-Jones products were shown, was followed by a social hour and dinner served in the plant cafeteria.

Main speaker of the evening was Harry B. Osborn, Jr., 1954-55 first vice president of ASTE and director of research at Tocco Div., Ohio Crankshaft Co. Dr. Osborn gave an address on "What's New in Industry."

On Feb. 7, the chapter met at Dania Hall in Racine to hear a talk by Vincent T. Peterson, district sales manager for O'Neil-Irwin Mfg. Co., Chicago.

—Alvin T. Michna

PEORIA—New student officers in the left-hand photo show, from left: William Logue, advisor; Robert Kautz, vice chairman; Donald Cox, chairman; Harold Lohnes, secretary; and William Myers, treasurer. In the other photo, congratulations are in order as Vic Schellschmidt, far left, chairman for 1954-55, gives his best wishes to Wilbur McWilliams, the chapter's newly-elected chairman. Others shown, from left: William Bahnfleth, secretary; Walter Ballard, first vice chairman; Leo Johnson, second vice chairman; and E. F. Bain, treasurer. More than 250 members attended the session.—*Russ Saurs*

Rochester Presents Affiliate Memberships

At a meeting held Feb. 7 at Barnard Exempt Club, Rochester chapter presented affiliate membership plaques to representatives of eleven industrial firms. Receiving the plaques were: Joseph S. Gray for Stromberg Carlson Co., Lorice H. Conrad for Rochester Products, Division of General Motors Corp., John C. Lawrence for Ritter Co., L. Ralph Whitehouse for Hickok Mfg. Co., Clarence Smith for Graflex Inc., William McQuat for Eastman Kodak Navy Ordnance, L. K. Eilers for Kodak Park Works, E. J. Underwood for Kodak Hawkeye Works, N. B. Green for Kodak Camera Works, and Harold McInnes for Delco Appliance Division of General Motors.

Guest speaker for the evening was F. W. Witzke, product supervisor, Brush Electronics Co., who discussed "The Importance of Super Finish in Industry."

—Paul Bruno

Fairfield County Elects Edgar Mayberry

New chapter chairman for the Fairfield County chapter is Edgar Mayberry. Assisting him in his duties will be Eugene Laistner, first vice chairman; Carl Horvath, second vice chairman; Francis Moriarty, secretary; Norris Green, treasurer; and Phillip Massilius, alternate delegate. Mr. Mayberry is also the national delegate.

The election meeting was held Feb. 2 at the Hitching Post Inn in Bridgeport, Conn., and was attended by 40 members. Guest technical speaker was C. F. Riordan, New England representative for S. C. Johnson & Son, Inc. He discussed wax coolants and cutting oil additives.

—Henry E. Busby

Patents Discussed at Springfield, Ill.

A talk on the different kinds of patents and the common patent infringement troubles was given Feb. 1 at a meeting of the Springfield, Ill., chapter. Speaker was Carlton Hill of the Chicago firm of Hill, Sherman, Meroni, Groso & Simpson.

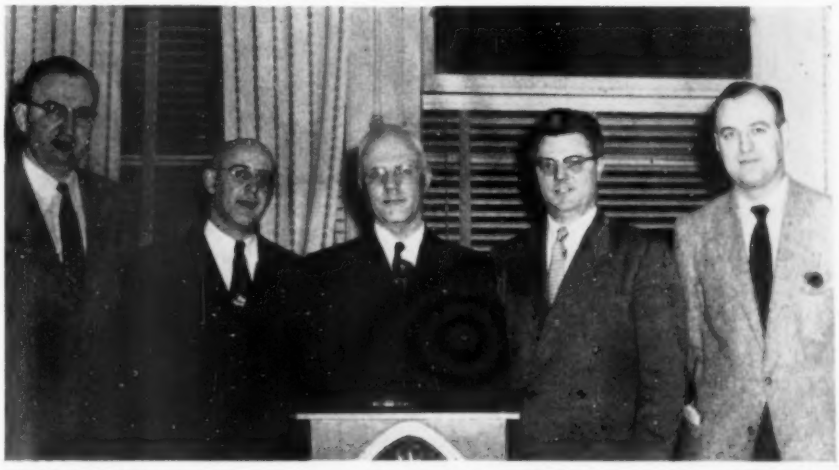
Mr. Hill covered the history of patents and also briefed his audience on the necessary steps in obtaining patents.

A chapter member, J. T. Youngblood, received a recent job promotion. He is now vice president and general manager of Sangamo Generators, Inc.

—Charles Collier

ROCHESTER—Elected to office for the coming year were: (front row) Arthur Lang, third vice chairman; John C. Lawrence, first vice chairman; William B. Kamola, chairman; Clifford E. Sears, second vice chairman; Carl W. Greenman, secretary; and Van Buren Hansford, treasurer. Standing: Joseph G. Windheim, chapter director; Gerald K. Sick, national delegate; Edwin J. Smith and John P. McCaffery, chapter directors.

WINDSOR—More than 100 members and guests met January 17 at Chrysler Corp. of Canada to discuss the Joint Industry Conference hydraulic standard. Participating in the lively session were, from left: E. A. Clifton, Bendix-Eclipse; D. L. Swan, Ford of Canada; N. Paddison, Chrysler; R. A. Smith, a national ASTE director; and O. Karlson, John S. Barnes Co.



NEW HAVEN—Leading chapter activities during 1955-56 are: (from left) John S. Brozek, national delegate and retiring chairman; George G. Griffiths, second vice chairman; Stanley S. Porritt, first vice chairman; Russell C. Applegate, secretary; and Chester Rybacki, treasurer. New chairman for the year is N. Charlton Gilbert.

LOS ANGELES—Officers of the Los Angeles chapter for the term of 1955-56 are, standing: J. E. Riddle, retiring chairman and new national delegate; Paul B. Slater, chairman and alternate delegate; Frank X. Balé, first vice chairman; Paul Lenk, second vice chairman; S. W. Winquist, secretary; and Al Beaumont, treasurer. Seated are: Anton Peck and Les Hawes.—*John A. Boettgenbach.*

PORTLAND, ORE.—Elected to office in February were: Joe Lomniaki, treasurer; Edward Reilley, secretary; Fred L. Allen, chairman; Robert C. Erickson, first vice chairman; and Walter Brenneke, national delegate. Second vice chairman for the coming year is Prof. Milton C. Sheely of Oregon State College.—*Walter Brenneke*

ERIE—Officers for 1955-56 were elected by the Erie chapter on Feb. 1 at the G. E. Community Center. They are, seated from left: David Schuler, first vice chairman; John August, chairman; and William Snook, chairman for 1954-55. Standing are: Walter J. Moser, secretary; Samuel A. Fiorenzo, treasurer; Ernest C. Hawkins, delegate to Erie Engineering Society Council; and Henry W. Sedler, second vice chairman. The technical program featured a talk by Robert J. Nist of Rockwell Mfg. Co. on drill units and air hydraulics.—*Samuel A. Fiorenzo*

Officers Named at Niagara District

Elected at the Feb. 3 meeting of Niagara District chapter were: Harold Crawford, chairman; Ralph Meacher, first vice chairman; Walter Pentesco, second vice chairman; Henry Litke, secretary; Kenneth Hiscott, treasurer; C. R. Mitchell, national delegate; and Mr. Crawford, alternate delegate.

Featured on the technical program was a "stump the experts" panel discussion. Speakers and their special topics were: Harold Chambers of Atlas Steels, selection and application and heat treating of tool steels; George Sibakin of Steel Co. of Canada, Ltd., production steels for machining and presswork applications; Hugh McMartin of Kennametal, selection, fabrication and uses of carbides.

—*W. A. Yaeger*

Hendrick Hudson Hears Harry Conn

Harry Conn, chief engineer for Scully-Jones & Co., was the guest technical speaker at the election meeting of the Hendrick Hudson chapter. He talked on "Tooling for Production" before a group of 98 members and guests.

Special guests were James O. Horne, a national director of ASTE; and W. W. Schug, chairman of the National Membership Committee.

Chairman Lisle Morse presented the chapter with a much-needed gavel and there was a display of equipment shown by the Sager-Spuck Supply Co., Carboloy Co., Boston Gear Works, the Union Twist Drill Co., the Ready Tool Co., and Behr-Manning Co.

—*James Kiernan*

Three Talks on Program for Mid-Hudson Meeting

An unusual program featuring talks on three widely separated subjects was presented Jan. 11 at the Mid-Hudson ASTE meeting. The Poughkeepsie Community Ambasador. Joseph Lombardie, Jr. described his recent visit to Turkey, where he was living with a Turkish family and became familiar with the country's customs.

James O. Horn, ASTE national director, spoke on national Society affairs, complimenting the chapter on its membership progress.

The technical discussion was presented by Edward Ball, sales engineer for National Broach & Machine Co. He spoke on gear finishing.

—*Davis Gale*

GREATER NEW YORK—Officers for the 1955-56 term for Greater New York chapter are from left: Julian Wille, first vice chairman; Julius Schoen, alternate delegate; William Reber, chairman; Fred Bechtold, treasurer; Jean Nasley, second vice chairman; and Robert Freckman, secretary.—*William Reber*

INDIANAPOLIS—Some 150 members of the Indianapolis chapter turned out for election night at the Sahara Grotto on Feb. 3. The new slate of officers for 1955-56 are from left: Theodore Harding, chairman; John Huser, first vice chairman; Richard Garber, second vice chairman; Roy Erickson, secretary; Murray Davidson, treasurer; and Joseph Enright, 1954-55 chairman and new national delegate

—*Murray Davidson*

LACROSSE—Mapping plans for the coming year are the newly elected officers of LaCrosse chapter. Seated is Robert Phillips, chairman. Looking over his shoulder are: Sidney Wall, treasurer and alternate delegate; Alan Charley, secretary; Wesley Bertelson, national delegate and retiring chairman; Arthur Moody, first vice chairman; and J. W. Hopkins, second vice chairman.—*Wesley Bertelson*

Carl Abbott Elected Detroit Chapter Chairman

Carl Abbott is the newly elected chairman of the Detroit chapter. Also elected to posts in the chapter were Leonard Lovings, first vice chairman; Tony Rogers, second vice chairman; Edward J. Novack, third vice chairman; Gregg Manchester, secretary; Herbert L. Sanborn, treasurer; and Stanley Phillips, retiring chairman, is national delegate.

Detroit's regular meeting featured a talk on "The Meaning of the Machine Tool" by E. H. Linsley, associate editor of *American Machinist* magazine.

The education section of the chapter heard two experts in the field of automatic handling and progressive production processes on Jan. 20. Speakers were John Rumsey and Jervis Webb.

On Feb. 3 the carbide section heard H. V. Harding of the Elox Corp. discuss "The Elox Process of Electrical Discharge Machining." On January 6, the group heard Edward J. Novack, district sales manager of Kennametal, Inc., discuss carbide applications and carbide grade selection.

On January 13 Detroit chapter held Father-Sons and Daughters Night, highlighted by movies, dinner, and live demonstrations of model airplanes, yachts, automobiles, and carriages. The evening ended with a tour of the Detroit Historical Museum. —*W. R. Schober*

Montreal Members Hear Talk by B. G. MacKenzie

About 120 members of Montreal ASTE chapter met Jan. 19 to hear a discussion on "Super Alloys in Industry." Speaker was B. G. Mackenzie, Stellite sales manager for Deloro Smelting & Refining Co., Ltd. He covered the lost wax casting process as well as other permanent mold casting techniques.

—*F. C. Henderson*

San Antonio Elects New Chapter Officers

Named to lead chapter affairs for the coming year at a recent San Antonio ASTE meeting were the following new officers: James A. Metcalf, chairman; Oscar G. Tobias, first vice chairman; Alton A. Hansen, second vice chairman; Maynard B. Berg, secretary; Mrs. Spence, treasurer; and E. Measels, Jr., National Delegate.

The meeting was held Feb. 9 at the Blue Bonnet Hotel, with 48 members in attendance. —*Stanley G. Gower*

CEDAR RAPIDS—Newly elected officers of Cedar Rapids chapter are from left: Robert J. Bloch, secretary; Morton A. Blum, chairman; Ronald L. Walder, second vice chairman; and Leslie R. Gouak, first vice chairman. James Goodall, treasurer was not present for the picture.

New Chapter Officers

CHAUTAUQUA-WARREN—The Moon Brook Country Club, Jamestown, N. Y., was the scene of Chautauqua-Warren's Feb. 10 election meeting. New chapter officers for 1955-56 are: seated, from left to right, Paul E. Anderson, first vice chairman; and Gordon Carlson, chairman. Standing are: Herbert Cave, national delegate; Leslie H. BeauJean, assistant secretary-treasurer; and Cleon L. Douglas, second vice chairman. Not pictured are Norman L. Wetter, secretary; and Laurence R. Green, treasurer.—*Leslie H. BeauJean*

HENDRICK HUDSON—The Circle Inn, Latham, N. Y., was the setting for the Hendrick Hudson elections on Feb. 16. Officers for 1955-56 are from left: Donald Clickner, secretary; David B. Done, treasurer; MacMillan McElwain, chairman; James A. Cardone, first vice chairman; and Felix R. Adams, second vice chairman.

LOS ALAMOS—Elected officers of the Los Alamos chapter for the 1955-56 term are from left: front row, Robert C. Cramer, alternate delegate; William C. Moxley, chairman; Gordon H. Anderson, first vice chairman; and Gerald B. Rogers, treasurer. In the back row are: Norman C. Blezek, second vice chairman; Basil S. Boss, secretary; and Herman J. Von Steeg, national delegate. The election meeting included a program by Raymond Francisco of the DoAll Co.—*Basil Boss*

LOUIS JOLIET—Men who will lead the Louis Joliet chapter in its activities for 1955-56 are front, from left: Ray Eken, treasurer; Mel Burdett, retiring chairman and new national delegate; Francis E. Bowers, chairman; and Paul Travers, second vice chairman; Standing at rear are: Harold Zierke, first vice chairman; and John Ingersoll, secretary.

CALUMET AREA—Officers of the Calumet Area chapter for 1955-56 are from left: Leslie Thill, chairman for 1954-55 and new National Delegate; Wayne Bates, treasurer; David Lambie, second vice chairman; and Cecil E. Chapman, chairman. Not pictured are David MacGregor, first vice chairman; and Robert J. Helton, secretary. —*L. W. Montgomery*

SANTA ANA VALLEY—Newly elected officers, from left, are: James West, secretary; David Reichert, first vice chairman; Paul Jones, Jr., chairman; Douglas Small, second vice chairman; LeRoy Connelly, treasurer. A program on die casting rounded out the program of the election night meeting.—*Leonard Krow*

NORTHERN NEW JERSEY—New officers elected Feb. 8, from left, are: W. K. Perry, chairman; Herbert Dietrich, first vice chairman; John H. Fleming, second vice chairman; Arthur J. Wotowicz, secretary; Alexander S. Hyliche, treasurer; Wilson Ryno, national delegate; and William Wheaton, alternate delegate. Speaker at the meeting was Earl Johnson, chief of development engineering at Rockford Machine and Tool Co.—*W. R. Wunderlich*

WESTERN MICHIGAN—Chapter officers for coming year, from left, include: Arthur J. Cook, chairman; William G. Bylsma, first vice chairman; John S. Pridgeon, second vice chairman; James R. Wagner, Jr., secretary; and Jim Rost, treasurer. Speaker at the election meeting was George M. Rice, sales manager of Ren-ite and Renaud Plastics, Inc.—*Jim Rost*

Admiral Guest Speaker at Cincinnati Meeting

At a joint meeting of the Cincinnati Technical Societies on Feb. 24, Rear Admiral H. G. Rickover, USN, was the guest speaker. Admiral Rickover, who was in charge of building the world's first atomic powered submarine, "The Nautilus," is now chief of Nuclear Power Division, Bureau of Ships, and chief of Naval Reactors Branch of the Atomic Energy Commission. The subject of his talk was "Engineering Problems in the Nuclear Age."

On Feb. 12, Cincinnati chapter held its annual dinner dance in the Marie Antoinette Room of the Alms Hotel. Approximately 400 members, wives and guests attended the affair. Dinner, dancing to the music of George Smith's orchestra plus a Valentine decorative theme made the evening an enjoyable occasion. —*Frank Houston*

Milwaukee Elects 1955-56 Officers

New officers for the Milwaukee ASTE chapter, elected Feb. 10, are: Stephen Pohlammer, chairman; Ralph W. Lund, first vice chairman; Hans G. Frommer, second vice chairman; Larry A. Wacker, secretary; and George L. Riordan, treasurer.

Technical speakers at the meeting were Erwin Kaiser and A. A. Ford of Giddings & Lewis Machine Tool Corp. who spoke on the planer type milling machine for skin milling of airplane wings. —*Walter Behrend*

Works Manager Speaks at Little Rhody Meeting

Joseph Kosinski, works manager of Scully-Jones & Co., was the guest technical speaker at the Feb. 3 meeting of the Little Rhody chapter. His topic was "Helping Yourself to Production Economies." He gave an illustrated lecture on the use of cutoff saws, tracer equipment for lathes, carbides and grinding of carbides. The meeting was at Johnson's Hummocks. —*Richard Kilbane*

H. B. Osborn, Jr. Addresses Louis Joliet

Dr. Harry B. Osborn, Jr., director of research for the Tocco Div. of the Ohio Crankshaft Co., was the guest technical speaker at the Jan. 18 meeting of the Louis Joliet chapter. Dr. Osborn addressed some 120 members and guests at the Woodruff Hotel on the topic "Tooling for Induction Heating."

—*Lionell Rohman*

Charleton Gilbert Heads New Haven ASTE Members

Elected at the Feb. 10 meeting, new officers at New Haven are: Charleton Gilbert, chairman; Stanley Pritt, first vice chairman; George Griffith, second vice chairman; Russell Applegate, secretary; and Chester Rybicki, treasurer.

Technical speakers on the program were Clyde A. Sluhan, president of Master Chemical Corp. and T. J. Blood, field engineer with Jones & Lamson.

—Silas W. Becroft

Coated Abrasives Discussed at Lehigh

"Modern Coated Abrasives in Industry" was the topic of a talk given by E. E. Oathout at the Jan. 21 meeting of the Lehigh Valley chapter held at the Hotel Traylor, Allentown, Pa. Mr. Oathout, eastern regional product engineer for Behr-Manning Corp., defined coated abrasives and their applications and the recent developments in the field. He stated that in the next 10 years nearly all grinding and polishing will be done with coated abrasives.

—Paul W. E. Gehris

Talk on Welding Given at Northern Massachusetts

John Duffy, New England representative for Eutectic Welding Alloys Corp., was the technical speaker at the Feb. 15 meeting of Northern Massachusetts ASTE members. About 100 were on hand to hear his discussion about new developments in the welding of tools and dies.

Introduced by Alvin Cooke, the guest speaker showed colored slides to illustrate the origin and development of low amperage welding processes. A question period followed his talk.

—Otto S. Nau

Lima Officers Headed by Chairman H. W. Carey

Elected officers of the Lima chapter were chosen at the Feb. 17 meeting. They are: H. W. Carey, chairman; J. Kuck, first vice chairman; W. Epley, second vice chairman; G. Siferd, secretary; V. Spahr, treasurer; Mr. Carey, national delegate; and Mr. Kuck, alternate delegate.

The featured speaker was Norman Dunlap of Minster Machine Co. Assisting him were Bob Jordan, electronics engineer, and Don Hartstreet, field representative. *—Don Cox*

MEMPHIS—Officers for 1955-56, from left, are: E. T. Crofoot, chairman; B. J. Shelton, first vice chairman; J. Frank Fly, secretary; and M. Zubatuk, treasurer. Nathan Tamm, second vice chairman, was not on hand for the picture.

—W. C. Roth

LEHIGH VALLEY—Members of the Lehigh Valley chapter elected their officers on Feb. 18 who are: from left, Ralph L. Mueller, chairman; Vincent Scalese, first vice chairman; Samuel Kuba, second vice chairman; Paul W. E. Gebris, secretary; Walter Yarema, treasurer; and Werner O. Miller, national delegate. "Civilization through Tools" by C. G. Shelley, of the Wilkie Foundation, and sponsored by The DoAll Co. was the technical program.

—Paul W. E. Gehris

PONTIAC—Officers for 1955-56, from left, are: Charles Smith, treasurer; Charles King, chairman; Charles Bay, secretary; and James Elliott, second vice chairman. Andrew Forester will serve as first vice chairman. At the chapter's January meeting, 150 members and guests toured the engine plant of Pontiac Division of General Motors Corp., Pontiac, Mich.

Springfield, O., Members Hold Executives' Night

Management executives of most of the metalworking industries in the Springfield, O., area were guests at the fifth annual executives' night meeting staged Feb. 1 by the Springfield ASTE chapter.

Featured speaker at the meeting, attended by 215 persons, was James F. Lincoln, chairman of the board at Lincoln Electric Co., Cleveland. Subject of his timely talk was "Incentive Management."

Chairman Paul W. Recknagel extended the chapter's welcome to the visitors. Editor of the *Springfield Sun*, Mayhard Kniskern, introduced the evening's speaker.

—Roger Horstman

SOUTHEASTERN MASSACHUSETTS—Guiding chapter activities for 1955-56 will be: (standing, from left) Merrill Hunt, Jr., secretary; Raymond E. Holbrook, chairman; John Cieplik, second vice chairman; and John H. Somers, national delegate. Seated: Richard B. Boynton, treasurer; and Ralph E. Manchester, first vice chairman.

LOUISVILLE—Shawnee Post was the scene of the Louisville chapter's Feb. 16 election. Officers serving for the next year are: from left, John Schell, treasurer; Boyd Cave, secretary; Robert Wohhueter, second vice chairman; James Davis, first vice chairman; and Jerome L. Krumpleman, chairman.—*Sam T. Gleaves*

Neil Van Deusen Speaks at Worcester Meeting

A talk on presswork and various automatic and semiautomatic operations was presented Feb. 1 at a meeting of Worcester chapter. Speaker was Neil Van Deusen, sales manager of V & O Press Co. His talk was illustrated by slides and a sound film. An open discussion followed Mr. Van Deusen's program.

Member news included the appointment of Lynn H. Lepley as general manager of Mil-Lor Engineering Co., Inc., Millville, Mass. He was formerly in charge of sales at Brookfield Machine & Tool Co., Inc.

—John C. Lalor

J. M. Lewis Addresses Santa Clara Chapter

"Friction Sawing—Past and Present" was the topic of the technical talk given Jan. 18 at a meeting of the Santa Clara Valley chapter. More than 70 members and guests attended the dinner session held at Mariani's Restaurant. Speaker for the evening was James M. Lewis, sales engineer for Montague-Harris & Co. of San Francisco.

—Harold Weaver

James Horne Visits Schenectady Chapter

Services and opportunities offered each member of ASTE was the subject of James O. Horne, national director of the Society, when he visited Schenectady members at their Jan. 14 meeting.

The evening's technical speaker was O. J. Seeds of Cerro De Pasco Corp., who talked on low temperature melting alloys as production aids.

—George S. Nelson

CLEVELAND PROFESSIONAL ENGINEERS—Toastmaster at the 19th annual banquet of the Cleveland Society of Professional Engineers was Harry B. Osborn, Jr., standing, 1954-55 first vice president of ASTE. Principal speaker at the event was Ray H. Sullivan, center, a vice president of Ford Motor Co. Also pictured at the speakers' table is G. Brooks Earnest, past president of Fenn College.

anton Chapter lects Officers

The Canton chapter's election night s held at the Swiss Country Club d was attended by 46 members. The w slate of chapter officers includes: airman—J. R. Huet; first vice chair- an—L. E. Dickerhoof; second vice airman—J. L. Nickas; secretary—J. Babbo; treasurer—S. E. Sherry; and legate—Virgil Shelton.

C. Smith was awarded an ASTE Handbook, and D. L. Hartman received lapel pin for prizes in the member- hip drive.

Guest technical speaker was N. C. Taylor, service engineer for Plastics Div. of Eastman Chemical Products, Inc., in Kingsport, Tenn. He discussed Thermoplastic Applications and Tool- ing for Same." —*G. C. Hornbeck*

Industrial Diamonds Is Topic at Wichita Program

Covering the applications of diamonds as related to tool machining and maintenance, Jan Taeyaerts, president of the Precision Diamond Tool Co., spoke on "Diamonds in Industry" at Wichita's January meeting. He described use for abrasive wheels, tool dressers, use in oil drilling and high fidelity sound equipment. Slides illustrated the discussion. —*John G. Temple*

"Old Timers' Night" Held at Philadelphia

Theme for the February ASTE meeting, held at the Philadelphia Engineers' Club, was "Old Timers' Night," in honor of the chapter's 40 charter members. An account of the early days of the chapter was given by Ed Hollingsworth, who introduced many of the original officers, including Conrad Hersam, John Strecker, and Paul W. Frankfurther, Sr.

The evening's program also included election of officers, a skit on the new membership proposal, and a social hour under the direction of Tom Donovan.

200 Couples Attend Peoria Ladies' Night

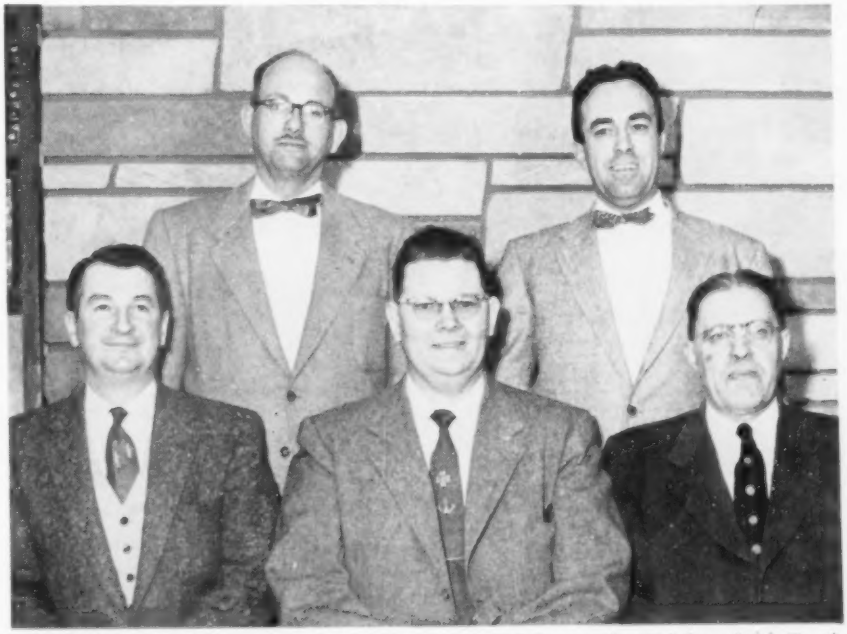
Peoria chapter's annual ladies' night, held Jan. 8 at the Pere Marquette Hotel, drew an attendance of 200 couples. Dinner and dancing, together with the presentation of Sunbeam appliances, made up the evening's program. Music was provided by the orchestras of Cary Robard and Dick Raymond.

—*Harold D. Baker*

SOUTH BEND—Serving as chapter officers for 1955-56, from left, are: John R. Becker, chairman; E. James Nelson, first vice chairman; Matthew J. Nowak, second vice chairman; Richard J. Spotts, secretary; and Fred Gross, treasurer. Speaker at the election meeting was Stanley R. Cope of Colfax Tool Enigneering Co.

—*Dave Herring*

WICHITA—Elected officers for the coming year, from left, are: R. O. White, national delegate; F. Earl Baker, secretary; Harold A. Schowalter, third vice chairman; James H. Janson, chairman; Paul R. Hess, second vice chairman; and Norman B. Watkins. Ray O. Dorow will serve as treasurer. The program included a talk by Russ Usinger of Mochlenpah Engineering, Inc.—*John G. Temple*



MID-HUDSON—Officers for the coming year, from left, are: (seated from left) Frank N. Plotnick, first vice chairman; R. Fitzgibbons, chairman; J. H. Keller, treasurer; (standing) W. F. Shopmyer, secretary; and C. Morgan Newberry, second vice chairman. The election meeting program also featured the "Civilization through Tools" exhibit of DoAll Co.—*Davis Gale*

Philadelphia officers were installed Feb. 17 by Roger Waindle, past president of ASTE. Pictured, from left: Edmund Hollingsworth, national delegate; Edward Stachel, treasurer; Robert J. Mason, second vice chairman; Edward H. Wheeler, first vice chairman; Karl L. Rauch, secretary; Richard D. Gross, chairman; and Mr. Waindle. The ceremonies took place at the chapter's "Old Timer's Night."

New Piedmont officers, left to right, front row, are: A. R. Fairchild, chairman; E. J. Zagora, third vice chairman; and Robert Schneider, secretary. Back row: Roy Palmer, treasurer; S. B. Jeffreys, national delegate; H. I. Newsome, second vice chairman; and E. M. Ketchie, first vice chairman.—*H. A. Longfellow*

Tri-Cities activities during the coming year will be guided by: (from left) Dan L. McKeon, second vice chairman; Rayburn M. Knabe, first vice chairman; Robert E. Cannon, national delegate; Maurice J. Ullman, chairman; Albert Vande Walle, secretary; and James Rosborough, treasurer.—*Clifford C. Vogt*

Tulsa officers serving for the next year, from left, are: C. E. Gahn, chairman; Sam Collier, first vice chairman; Charlie Bucklin, second vice chairman; Bill Riggs, secretary; and Joe Morrow, treasurer. The technical talk at the election meeting was given by John Hussey of the American Tool Works Co.

—Arlie I. Zumwalt

Tucson chapter chose new officers on Feb. 8. Elected were: (from left) John Oberteuffer, first vice chairman; Harry McClain, chairman; Clark Pierce, treasurer; and Harry DeLong, secretary. The program also featured a discussion on surface roughness by James Meehan of Brown & Sharpe Mfg. Co.—*J. W. Vincent*

Hamilton Elects New Officers for 1955-56

Officers who were elected by the members of the Hamilton District chapter on Feb. 11 are: chairman—F. C. Johnson; first vice chairman—J. A. Sheldon; second vice chairman—H. B. Ward; third vice chairman—R. I. Hall; secretary—W. E. Orcutt; treasurer—R. J. Fechnay; delegate—J. M. Snyder; alternate delegate—F. C. Johnson.

As is the custom on election night a member of the chapter was the technical speaker. Fred P. Bradley, manager of Bradley Machine Co., Ltd., spoke on "Press Brake Tooling." A discussion period followed his talk.

—G. W. Hawkes

RIVERSIDE—Incumbent chapter officers, having held office for only three months, were unanimously re-elected to serve for the coming year. From left, they are: E. W. Denny, chairman; F. E. Winters, secretary; E. H. Busher, national delegate; L. G. Heustis, first vice chairman; D. R. Watkins, second vice chairman; and H. M. Foster, treasurer.—*Oris G. Feuling*

ELMIRA—Newly elected officers of the Elmira chapter include: from left, Francis Shepherd, chairman; Arthur Green, first vice chairman; Michael Burfalin, second vice chairman; John Graham, secretary; Carlton Beach, treasurer; Charles Roe, delegate; and Edwin Bates, alternate delegate. W. C. Thomas of S. C. Johnson & Son, Inc., discussed "Metalworking Waxes" at this Feb. 17 election meeting at the Mark Twain Hotel.—*John F. Puro*

NASHVILLE—Conducting chapter affairs for the next year will be: (back row, from left) J. T. Stibor, first vice chairman; August Dobert, national delegate; John Riordan, chairman; and Harry Collins, secretary. Front row: Frank Friedmann, treasurer; and Lee Severy, second vice chairman. Technical speaker at the election meeting was W. Kent Mathias, manager of grinding machine sales at Cincinnati Milling Machine Co.—*Harry E. Collins*

Mohawk Valley Members See Sheffield Exhibit

The "Civilization through Tools" exhibit, showing the history of tools and toolmaking from 1 million B.C. through today, was shown to 125 Mohawk Valley members at the January ASTE meeting. It was accompanied by an interesting discussion by C. G. Schelly, director of the Filkie Foundation of Sheffield Corp. which is sponsoring the traveling exhibit. National Director James Horne was a guest at the meeting.

—E. J. Masucci

Pennsylvania Chapter Holds Executive Night

Despite a very bad sleet storm, Central Pennsylvania chapter's Annual Executive Night on Feb. 1 was attended by 125. The weather kept many members and guests from the Cumberland and Lykens Valley areas home. The meeting was held in the Mirror Room of the Hotel Yorktowne in York, Pa.

Joseph P. Crosby, national ASTE president for 1954-55, was a special guest. President Crosby sketched the growth of ASTE, explaining the functions of national officers, national committees, THE TOOL ENGINEER magazine, and handbooks published by the Society, emphasizing the importance of local chapters and the individual tool engineer.

David A. Schrom, member of the National Editorial Committee and plant manager of the York Corp., was toastmaster, D. B. Spatz and his committee were in charge of the successful event.

The guest list included a large group of top industrial leaders from the local companies as well as chairmen of the local chapters of ASTE, ASME, AMS, ASM, AWS, York Engineering Society, Society of Professional Engineers.

—Paul F. Leese

lm, Plant Tour on ansas Student Programs

low automatic machines and tooling used in industry was shown in a r film at the Feb. 10 meeting of the iversity of Kansas student chapter. ade by the Bellows Co., the film was titled "Operation Pushbutton."

Two days later the chapter toured erations at the Co-op Nitrogen Fertilizer plant in Lawrence, Kan. Despite ero weather, a large number of members turned out for the plant visitation.

—Kenneth Crabtree

PITTSBURGH—Officers for 1955-56, from left, are: Elwood W. Weissert, national delegate; Paul H. Magnus II, chairman; Edwin S. Phillips, first vice chairman; J. Albert Bircher, second vice chairman; George C. Long, treasurer; and Charles D. Muir, secretary. Speaker at the election meeting was Dr. John W. Graham, Jr., assistant dean of the College of Engineering and Science at Carnegie Institute of Technology.—*E. L. Caughy*

Joseph Deck Elected Ft. Wayne Chairman

New officers chosen at Ft. Wayne chapter's February meeting are: Joseph Deck, chairman; Richard Good, first vice chairman; Eugene Gildea, Jr., second vice chairman; Dave Chambers, secretary; and John Thimlan, treasurer.

Recipient for the 1954 award pin for outstanding service to the chapter is Dave Chambers who was selected for his fine record in planning and arranging the past year's schedule of plant tours. *—R. H. Bienz*

SEATTLE—Serving as chapter officers for the coming year, from left, will be: Clarence Downie, treasurer; Tony Konecyny, second vice chairman; John Fellows, first vice chairman; Frank Stasny, chairman; and Aubrey Jones, national delegate.

POTOMAC—The men who will lead the Potomac for the coming year are: from left, Leo P. Schade, executive committeeman; Joseph S. Black, chairman; Arthur M. Johnson, first vice chairman; Otto P. Werle, second vice chairman; William D. England, secretary; and David G. Painter, treasurer.—*P. C. Whiteleather*

EVANSVILLE—The Hadi Shrine Temple was the scene of the Feb. 14 elections of Evansville officers. They are: from left, Monroe E. Ringis, secretary; Roy F. Ackerman, second vice chairman; Carl Doughty, chairman; Russell H. Wiberg, first vice chairman; and Charles M. Walker, Jr., treasurer.—*William H. Brooks*

Memphis Chapter to Meet at University

The April meeting of the Memphis ASTE chapter will be held at the University of Mississippi in celebration of Engineering Day, part of the activities connected with the dedication of the University's new Engineering Building.

Other organizations joining in this April 16 event are the American Institute of Chemical Engineers and the Mississippi Geological Society. There will be a general meeting of all groups and students with a speaker and luncheon, followed by individual sessions. Tours of the new building are also on the agenda. Climaxing the day will be a banquet and dance.

Robert E. McKee, chairman of the ASTE National Education Committee, will attend the all-day meeting.

On Feb. 11 officers of the Memphis chapter were elected at the King Cotton Hotel. Technical speaker was G. R. McCalla, president of the J. E. Dilworth Co. His topic was 'Mill Suppliers as Adapted to Tool Engineering."

On Jan. 15 the chapter heard a talk by L. D. Richardson of Eutectic Welding Alloys Corp. on "Techniques of Tool Welding and Repair of Tools by Welding. *—Frank Fly*

1955-56

CHAPTER officers

New chapter officers for Springfield, Ohio, from left, are: William Anderson, secretary; Bill Smith, chairman; Bob Melchi, second vice chairman; Andrew Reeb, first vice chairman; Walter Ulane, treasurer.

Heading the new slate of Syracuse officers is V. J. Fitting, seated, center. Taking office with him are: P. H. Hansel, seated, left, second vice chairman; A. A. Lachner, first vice chairman; and (standing) Buck Verrillo, secretary; and O. E. Sterner, treasurer. —*Andrew Lachner*

Retiring Racine chairman Morrice E. J. Otto, second from left, wishes Robert N. Freres good luck and success in his new post as chapter chairman. Other new officers pictured, from left, are: Vitas T. Thomas, second vice chairman; LaVerne Hicks, first vice chairman; and Paul Bunck, treasurer. Secretary for the coming year is Robert E. Monfeli.

San Gabriel Valley officers for 1955-56 are: (seated) Irving Greensides, national delegate; Ed Cutler, chairman; Lincoln Mager, first vice chairman; (standing) Joe Majdik, second vice chairman; Allan Howell, secretary; and Elmer Button, treasurer. Speaker at the meeting was Harry E. Conrad, executive secretary of ASTE, who discussed the Western Industrial Exposition.—*J. S. Wajdik*

Serving as the top officers for Northern Massachusetts chapter in 1955-56 will be: Casimir Pinigs, treasurer; Robert W. Huxtable, chairman; Alvin Cooke, first vice chairman; and Stuart E. Sinclair, second vice chairman. Secretary is Robert H. Tolman.

Filling the Santa Clara Valley chapter's highest offices for the next year will be: (from left) Karl Kaiser, second vice chairman; Frank Menard, chairman; John Groves, treasurer; Alan G. Dimond, secretary; and William T. Wright, first vice chairman. National delegate is J. T. McCarthy. Speakers at the meeting were National Director Ben Hazewinkel and Harry L. Strauss, Jr.—*Harold Weaver*

Albuquerque officers are, from left: Paul Steward, secretary; William Porter, first vice chairman; Julian Moody, chairman; Herbert Hanen, second vice chairman; and James Felter, treasurer.—*J. C. Moody*

Directing Little Rhody chapter activities for the coming year will be: front, from left, Paul Watelet, first vice chairman; and Phillip J. Peckham, Jr., chairman. At rear are: Horace Bennett, second vice chairman; and Gilbert Stafford, treasurer. Karl Friedland, secretary, was not present.

Election night for the Fond du Lac chapter was held Feb. 4. The 75 members present elected, from left: Harry Soukup, treasurer; Jack Barr, national delegate; H. S. Faith, chairman and alternate delegate; and Martin Kosac, secretary. Not shown are: George West, first vice chairman; and Lynton Kirby, second vice chairman. Program speaker was Charles Arps of Allis-Chalmers Manufacturing Co.—*R. M. Hanson*

Directing activities of the Granite State chapter for the coming year will be, from left: Robert Ellison, treasurer; Richard N. Wiley, national delegate; Jacob Mutzbauer, chairman; Gino F. Magnani, first vice chairman; and Darrell L. Mitchell, second vice chairman. Frederick I. Wakefield is secretary.

On Feb. 15, members of the Battle Creek chapter elected these officers. Front, from left, are: C. F. B. Koons, chairman; and H. P. Garmes, first vice chairman. Looking over their shoulders are: C. G. Holdridge, second vice chairman; H. G. Martin, secretary; and R. A. Hess, treasurer.

—Arthur F. Damon

Cincinnati officers for 1955-56 were elected Feb. 24 at the Wilson Auditorium. Seated from left are: Molar Duff, Jr., second vice chairman; John H. Elfring, chairman; and Dr. Max Kronenberg, first vice chairman. Standing are: Richard Neibusch, alternate delegate; Broadus Rusk, treasurer; Julius Steinhoff, secretary; and W. J. Fredericks, national delegate to the Annual Meeting.

CLEVELAND—Men who will guide the destinies of the Cleveland chapter for the next year are: from left, Andrew B. Cirbus, chairman; Howard C. Noll, first vice chairman; Carl I. Leske, third vice chairman; Pat R. Taverna, second vice chairman; Herbert Groth, treasurer; Martin George, secretary; and Harold Housewerth, retiring chairman and national delegate.—*R. H. Snippel*

BENTON HARBOR-ST. JOSEPH — Newly elected officers of the Benton Harbor-St. Joseph chapter are: from left, Lewis Simpson, treasurer; Ivan Peters, second vice chairman; Allen Ashley, chairman; Virgil Ramsey, secretary; and Harold Neuman, first vice chairman.
—*Bernard F. Ladewski*

MUNCIE—Newly elected officers of Muncie chapter are pictured in this photo taken by Don Wedlick. From left: Carl A. Darger, national delegate; N. Francis Wilson, treasurer; Don C. Wedlick, first vice chairman; Vynul Eley, chairman and alternate delegate; Emmett Blocher, second vice chairman; and Lester F. Lotz, secretary.—*Darrell Marks*

ANN ARBOR—ASTE officers serving for the next year, from left, are: Ira Montague, secretary; Dell Asplund, national delegate; Bert Fleming, chairman; Hector Haas, first vice chairman; and Dave Peterson, second vice chairman.
—*Laurence Charnitksy*

Positions Available

OLING DRAFTSMAN—The George Detterbeck Co., 1871 Clybourn Ave., icago 14, Ill., has need for experi-ced draftsman. Must have Brown & harpe engineering knowledge and be apable of layout work. The man who an qualify will find an excellent con-ection with a well-established (45 ears) nationally known concern, rec-gnized everywhere for highest qual-ty tools. When answering, state quali-fications and experience. All inquiries will be held in strictest confidence.

GRADUATE MECHANICAL ENGI-NEER—Graduate mechanical engineer of minimum 6 years' plant experience in sheet metal tooling and processing. Must be capable of assuming respon-sibility for complete product tooling from design drawings.

PRODUCTION TOOL ENGINEER—Must be experienced in tool and fix-ture design, methods and plant layout. Prefer man with experience in fixture and die design. Must be capable of carrying assigned projects with mini-mum supervision.

Above two positions with medium-size company. Full insurance benefits. Located in central Michigan. Give com-plete resume of education and experi-ence, plus references in letter. Reply to Box 033, News Department, The Tool Engineer, 10700 Puritan Ave., Detroit 38, Mich.

Servo-Mechanisms Topic at Cedar Rapids Meeting

"Servo-Mechanisms" was the topic of a talk given by E. L. Hulla before 30 members of the Cedar Rapids chapter on Feb. 10 at the Hotel Montrose. Mr. Hulla, electronics engineer for Westing-house Electric Corp., explained the servo-devices and their applications.

On Jan. 13, K. R. Blake, vice presi-dent and consulting physicist of Metal-loid Corp., talked on "Dynatomics—a New Concept in Metal Removal."

—Robert J. Bloch

Harry E. Conrad Visits San Fernando Chapter

Guest at the Feb. 2 meeting of the San Fernando Valley chapter was ASTE's executive secretary, Harry E. Conrad. He gave a brief talk on the Western Industrial Exposition, high-lighting the activities planned in con-nection with the event, including the annual membership banquet.

The technical program was provided by A. E. Yeoman, vice president of Toolnu, Inc., who spoke on salvage of worn tools, dies and cutters.

—A. J. Soares

HAMILTON DISTRICT—Retiring Chairman John M. Snyder presented two silver tankards to J. N. Walton, past chairman and charter member who is leaving the Hamilton chapter for Wind-sor. The award was a token of appreci-ation for his long service with the chapter.

Ernest Pawley Speaks at Fort Wayne Meeting

Approximately 60 members and guests of the Fort Wayne chapter met Jan. 12 at the Chamber of Commerce to hear Ernest Pawley, engineer of the Ultrasonics Div. of Sheffield Corp. Mr. Pawley discussed the "Cavitron," show-ing slides to illustrate new ultrasonic machining processes.

Roland Hille, ASTE representative for the National Engineers' Week, an-nounced the plans and projects for the event, including a clay model of the local Nickel Plate Railroad Underpass on display at a local department store.

The coffee speaker, C. Lane Breiden-stein, manager of the Fort Wayne Better Business Bureau, talked on "Greedy Eyes on Your Pocketbook."

—Robert H. Bienz

Tool Conservation Topic at London-St. Thomas

Members of the London-St. Thomas chapter met at the Cobblestone Inn on Feb. 17 to hear a talk on "Tool Con-servation." Speaker was Alfred True-man, supervisor of tool engineering at General Motors Diesel, Ltd. Mr. True-man discussed how costly a large inven-tory on tools could be, showing that the inventory could be reduced by set-ting up a system to rework obsolete tools into other tools.

—F. W. Lewis

Talk on Pivot Punches Given at Peterboro

Edmund Klonowski of Pivot Punch & Dis Corp. was the technical speaker at the Jan. 5 meeting of the Peterboro District chapter. His topic was "Pivot Punches—Their Uses and Applica-tions." Color slides illustrated his dis-cussion.

A nomination committee of R. Naish, J. Graham and D. Douglas was selected to choose the slate of 1955-56 officers.

—D. G. Moorby

L. D. Richardson Gives Philadelphia Program

On Jan. 20, L. D. Richardson, super-visor of sales and service for Eutectic Welding Alloys Corp., addressed mem-bers of the Philadelphia chapter. He spoke on "Welding for Tool and Die Salvage."

Movies and slides highlighted many specific points in the speaker's discus-sion. He emphasized the necessary re-quirements for welding as manipulating skill and 'know-how.'

—K. Ranch

MERRIMACK VALLEY—Pictured are the newly elected officers. From left: Harry Clement, alternate delegate; Ralph I. Robbins, national delegate; Everett Leavitt, first vice chairman; Fred T. Goodwin, Jr., chairman; Ralph L. Draper, treasurer; and Maurice Subilia, secretary. R. Moen Smith will serve as second vice chairman. Technical speaker at the election meeting was Frank Zagar, vice president and gen-eral manager of Zagar Tool, Inc.—*Ralph L. Draper*

TOLEDO—Officers for the coming year, from left, are: Lewis C. Pascoe, first vice chairman; James F. Sullivan, treasurer; Walter J. Toepfer, chairman; Philip C. Wood, secretary; and Allan G. Warren, second vice chairman.—*W. J. Toepfer*

Positions Wanted

SALES ENGINEER—Seeking position with manufacturers representative of agent for machine tools and/or allied equipment. M. E. degree, age 28. 4 years' sales experience with machine tools and industrial equipment. 3 years' office and shop experience. Living in Detroit, Michigan area preferred. Write to Box 034, News Department, The Tool Engineer, 10700 Puritan Ave., Detroit 38, Mich.

INDUSTRIAL REPRESENTATIVE—Past chairman of Canadian chapter, age 39, widely connected with 20 years' industrial background. Present position works manager. Previously acted successfully as sales manager, production manager, project engineer and purchasing agent. Now interested in representing progressive American manufacturer of industrial equipment in Canada. Write to Box 023, News Department, The Tool Engineer, 10700 Puritan Ave., Detroit 38, Mich.

PROCESSOR—Farm implement factory where he has worked for past 18 years is closing. Three years of high school and graduation in mechanical drafting at technical school. Varied moderate experience with engineering bill of material records, supervising tool design and ordering tools and writing process sheets for parts made on punch presses, bulldozers, upsetters, arc welders, and foundry molding machines for medium quantities of iron castings and steel members used in farm implements. Offers to work diligently in any capacity within ability offering steady employment and secure future.

Married, 39, nondrinker, nonsmoker, two children—all Canadian citizens, but would become U.S. citizens and like to locate in southern or western states. Write to Box 032, News Department, The Tool Engineer, 10700 Puritan Ave., Detroit 38, Mich.

N. Kenneth Perkins Speaker at Granite State

N. Kenneth Perkins, project engineer for International Business Machines Corp. was the guest speaker at the Feb. 15 meeting of the Granite State chapter. His topic was "Machining of Small Precision Parts." A special guest at the meeting was Richard A. Smith, a national director of ASTE.

—*Robert Ellison*

Gary Schroer Elected Kansas City Chairman

At the February meeting of the Kansas City chapter elections were the main item on the agenda. When the ballots were counted, Gary J. Schroer had the support of his chapter for the chairmanship. Serving with him will be: first vice chairman—Winton Jenson; second vice chairman—Maurice Manning; treasurer—Joseph Gardner; secretary, Donald Flick. —*R. W. Corliss*

Don Fish Heads North Texas Chapter

Guiding activities of the North Texas chapter for the coming year will be: Don Fish, chairman; Paul Simpson, first vice chairman; Lou Janecke, second vice chairman; J. O'Connor, secretary; and Jim Brown, treasurer.

The technical talk at the election meeting was presented by Charles Youmans of the Cyril Bath Co. He spoke on precision cold stretch forming. —*R. E. McMahan*

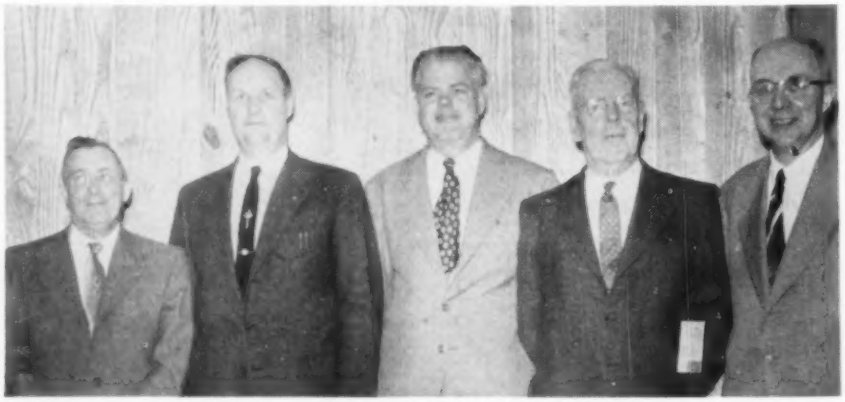
C. G. Schelly Presents Program at Binghamton

C. G. Schelly, managing director of the Wilkie Foundation, presented his now famous program, entitled "Civilization through Tools," sponsored by the DoAll Co. The meeting was held at the Elks Roof Garden and nearly 200 attended.

It was a joint meeting with the Southern Tier Society of the American Society for Quality Control.

—*Paul J. Adamek*

LOS ANGELES—John A. Boettgenbach, editorial chairman for the Los Angeles chapter was awarded the chapter service pin for his efforts on behalf of the chapter on Feb. 10. J. E. Riddle, 1954-55 chairman, presents the pin.

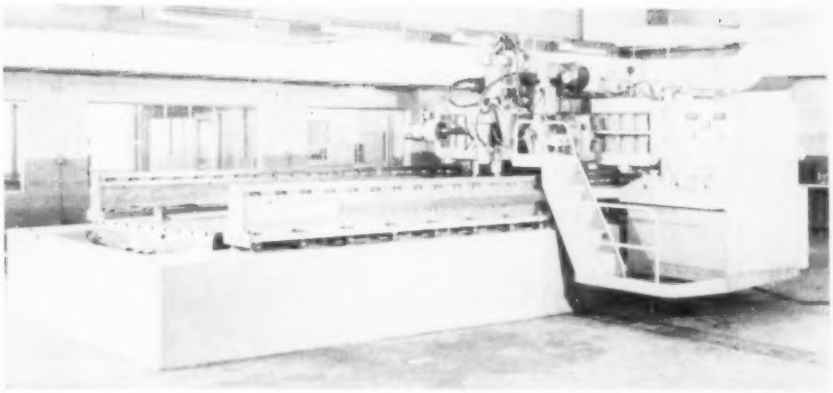


FOX RIVER VALLEY—Officers who will direct activities of the Fox River Valley chapter for the coming year were elected at the Feb. 22 meeting. They are: from left, Willard Perkins, chairman; Robert Evans, first vice chairman; Harold Smith, second vice chairman; Charles Olson, secretary; and Donald Zierk, retiring chairman and national delegate. Ralph Keck, treasurer, was absent.—*R. J. Evans*

PROGRESS in production

HIGH SPEED CONTOURING OF ALUMINUM PARTS

To meet the specialized needs of the aircraft industry, a basic machine has been developed for the specific purpose of milling aluminum. After consulting with aircraft manufacturers and Air Corps officials, Mercury Engineering Corp. developed the Copymill for high-speed contouring aluminum alloys. This travelling bridge machine has weight consistent wtih torque and horsepower requirements, and sufficient rigidity to make high traverse rates without deflection. Spindle speeds, which are infinitely variable from 1000 to 10,000 rpm in two ranges, are optimum for milling aluminum. The swivel table permits milling wing ribs without cams or duplicator. Over-all design is calculated to make large reductions in setup and machine time.



Duplicating system of the Copymill is a 3-dimensional electrical-hydraulic contour duplicating system in which a full-size master is reproduced through a tracing system. It has 360 deg contour control tracing system plus vertical trace. Double hydraulic motors incorporated in both the longitudinal and transverse drives allow a speed range from 0 to 300 ipm, while minor alterations would permit this speed to be doubled.

An interesting safety device, called the Jumpout, is incorporated in the cutter head. In case a chip lodges under the cutter, the Jumpout instantaneously withdraws the cutter from the work thus protecting the surface from scratching and the tool from fracturing.

Currently the machine is being produced with a working area of 72 x 180 in., however, the design is adaptable to a width of 120 in.

Mercury Engineering can supply specially designed cutting tools of any profile from $\frac{1}{4}$-in. to 12-in. diameter. These tools are designed to utilize either industrial diamonds, tungsten-carbide or stellite.

PROTECTING TOOLS WITH PEELABLE PLASTIC

Simple protection in the form of butyrate peelable plastic coatings is finding increasingly wide application as a packaging material among users of cutting tools as well as among companies which stock a large inventory of metal precision parts.

Illustrated is an example of the plastic material being used at Carrier Corp. to cover a cutter to protect it between jobs. In this instance, the tool is dipped by holding it half immersed in the hot melt and revolving it slowly. Full immersion is unnecessary because only the cutter teeth need protection. The plastic will harden on the tool making an airtight covering that will protect indefinitely, either against scratching or deterioration, while on the shelf in inventory, or in the crib awaiting further use.

Cutter edge is sealed before storing

When needed, the tool, in good condition, is exposed quickly, easily and completely by simply scoring the surface of the plastic and stripping it away. The used plastic may then be returned to the melt tanks for repeated reuse.

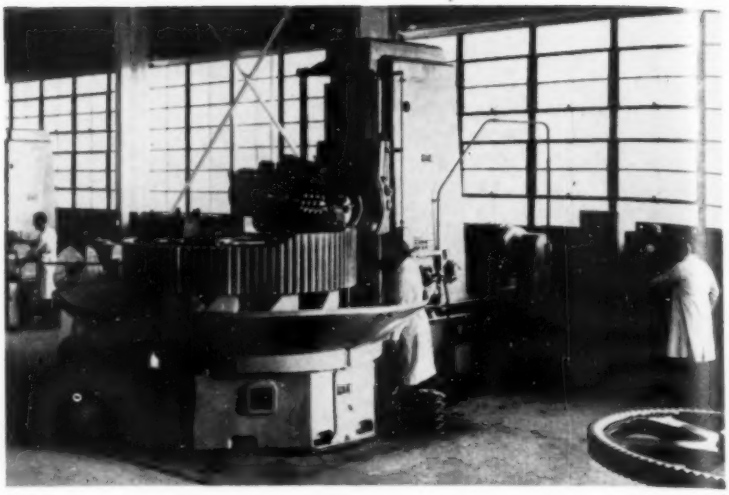
MAMMOTH HOBBER DOES PRECISION JOB

This 132-inch Gould & Eberhardt heavy-duty gear hobber, among the largest machines of its kind in this country, is doing precision work on gear blanks up to and including 132 inches in diameter, 3½ C.P. and 54-inch face, at Illinois Gear & Machine Co.

Big as it is, the gear hobber will cut spur, helical and worm gears to a tolerance of 0.0003 in. for maximum tooth spacing error, and to a tolerance of within 0.001 in. for the parallelism of the teeth. It will safely handle a worktable load of 100,000 lb.

Possibly the largest ground hobs made, 12-in. diameter and 15-in. face, are used on the unit.

The smallest diameter gear which can be cut in this machine is 44 inches in diameter. •



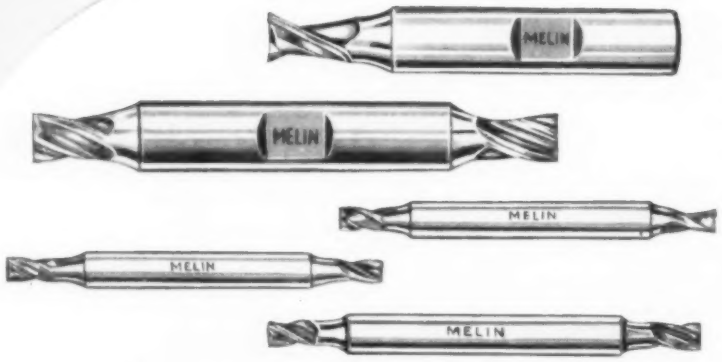
MELIN

STUB LENGTH END MILLS

with flutes shorter than regular

Offer GREATER STRENGTH...★

TWO, THREE AND FOUR FLUTE



...★ *Plus an Exclusive*... In addition to manufacturing a *complete* line of End Mills, the Melin Tool Company makes several standard *Stub Length Mills* exclusive of other tool manufacturers.

The new Melin Tool Catalog No. 54-C lists the specifications on these *all inclusive* Stub Length Tools...and...they offer greater strength and less breakage. Write for your catalog . . . today.

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MELIN TOOL CO. INC.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-168

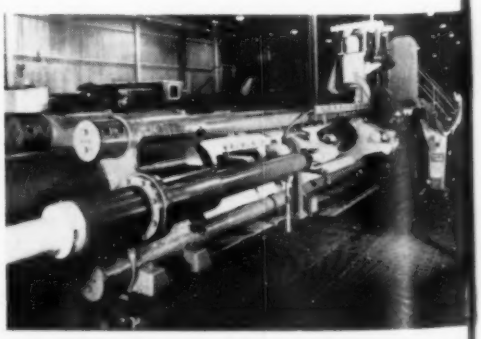
BUDGET EXTRUSIONS TO CUSTOMER ORDER

Production of "custom made" extruded carbon steel sections by the Ugine-Sejournet Process is under way in Jones & Laughlin Steel Corp.'s new hot extrusion plant in Pittsburgh. Initial extrusions are in solid sections ranging from ⅓ to 12 lb per lineal foot and up to 24 ft long.

According to Howard M. Knoblock, manager of Cold Finished Products, the extruded sections can be produced economically in small quantities, hence can be custom made for each order.

Prime equipment of the new facility is the extrusion press design to J&L specifications and built by Loewy-Hydropress, Inc. Hydraulically-powered with a horizontal stroke, the unit can operate at pressures up to 1,000 tons.

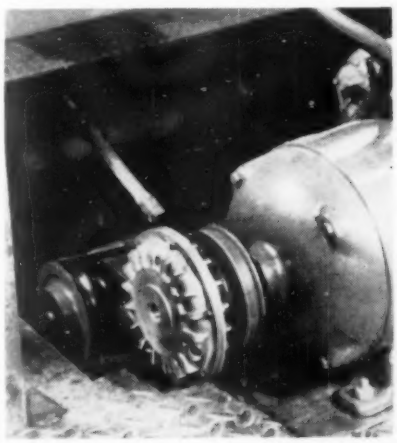
Production is automatic, done in this sequence: a billet, cut to pre-determined length by an automatic cut-off machine, is heated in a Magnethermic induction heating unit to 2300F. Emerging from the heating unit, the billet rolls through powdered glass which serves as the die lubricant. An automatic loader picks up the billet and transfers it to the loading end of the extrusion press, where it is positioned by the hydraulic ram which then pushes it through the die. The extruded bar is conveyed automatically to a cooling bed.



TOOLS of today

Power Transmission Drive

Development of a fluid-type drive that does not slip at normal operating speeds has been announced by Dodge Mfg. Co., Mishawaka, Ind. Design of the unit makes it a controlled no-slip, however, and in the case of an overload, it is slippage which gives protection. This development in industrial power transmission, called Flexidyne, is described as a dry fluid drive, and is a redesign based on a development originated abroad. Primarily, it is suggested for application on industrial drives involving heavy inertia and shock loads.



To assure accurate overload protection, the Flexidyne can be set to slip at any point from 20 percent over full load torque to as high as peak motor torque. Current draw is at a minimum during starting and overload periods because, with the standard Flexidyne setting, the motor is never pulled down to less than 90 percent of synchronous speed.

The Flexidyne drive is made up of a housing containing a rotor which is free to turn concentrically. Between the rotor and the housing are fine particles of spherical steel shot, called the flow charge, which acts as fluid.

The Flexidyne drive is to be sold as an on-the-shelf item by Dodge distributors throughout the United States, in standard diameter sizes from 7 to 11 inches which can be readily adapted by the user to horsepower requirements from 3 to 33 hp. **T-4-1691**

Toolroom Lathes

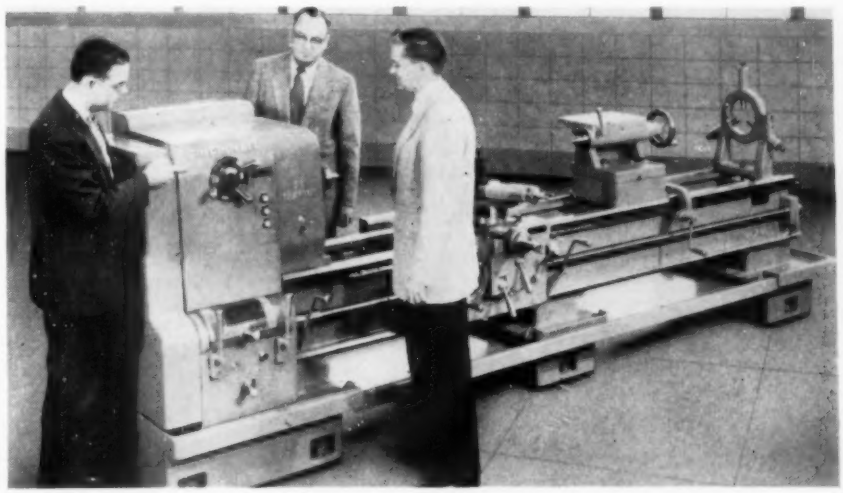
Two toolroom lathes are announced by Cincinnati Lathe & Tool Co., Cincinnati 9, Ohio.

These all-geared head Tray-Top lathes, swinging 21½ and 26 inches, have 12 spindle speeds in geometric progression, with a 3-lever, color-match, direct-reading shift mechanism.

The spindle, with long taper key drive nose, is rigidly mounted in three zero precision antifriction bearings. Diameter of the hole through the spindle is 1 13/16 inches for the 21½-inch lathes, with a 2 7/16-inch diameter hole available on demand. The 2 7/16-inch diameter spindle hole is standard for the 26-inch lathes.

Fifty-four thread and feed changes are made available through a totally enclosed, automatically lubricated quick-change gear box, where a lever to reverse the leadscrew is also incorporated.

A fully enclosed electrical panel provides a safe and accessible place for the power connections. A built-in dis-



connect switch guards against exposing a live panel. Power is transformed from 220 volts and over to provide only 110 volts at the operator's pushbuttons.

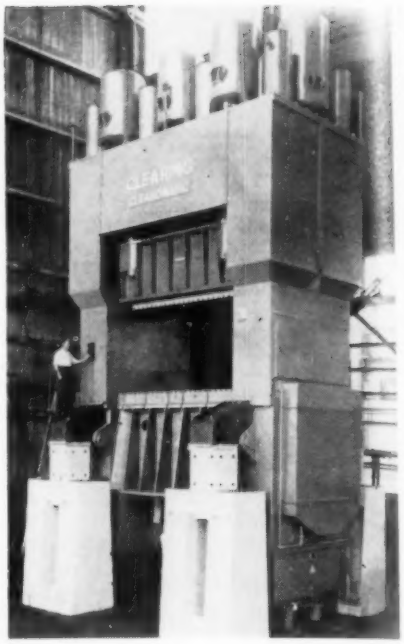
The lathes are offered with a 5 or 7½-hp motor mounted on the rear of the headstock for easy maintenance.

These new Cincinnati lathes are handled by independent machine tool dealers in all parts of the country. Their names and descriptive literature may be obtained by writing the manufacturer. **T-4-1701**

Press for Fast Drawing

Clearing Machine Corp., division of U. S. Industries, Inc., has developed a press which makes it possible to speed up the production of deep-drawn stampings. The press, called the Clearomatic, speeds up the entire cycling rate for drawing parts with a system of planetary gears in the press clutch.

The Clearomatic approaches the work and returns to top stroke at an unusually high speed. The drawing portion of the stroke is accomplished



very slowly—usually slower than normal in a conventional draw press. However, in the new press, nonworking portions of the cycle are accelerated in the ratio of three to one in relation to the draw speed. In this way, over-all cycling time of a Clearomatic press is roughly twice as fast as a conventional press.

Additional information on the Clearomatic press is available from the manufacturers, 6499 W. 65th St., Chicago, Ill. **T-4-1702**

HEAT TREATING 15 Thousand Drills A Day at *New Process*

For real endurance and accuracy in heat treating high speed steels, the New Process Twist Drill Company of Taunton, Massachusetts recommends Sentry Furnaces without reservation. Daily heat treating of 9 to 15 thousand drills, miscellaneous milling cutters and form tools of M1 and M10 types of high speed steel with complete freedom from decarburization, calls for utmost furnace performance and reliability. Sentry High Speed Steel Hardening Furnaces with the Sentry Diamond Block Atmosphere assure highest quality hardening and elimination of costly spoilage. Here at New Process under exacting production requirements, Sentry equipment has again proved its worth.

Sentry ELECTRIC FURNACES

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Request Catalog P-46
Tells the full story of Sentry Furnaces and The Sentry Diamond Block Method.

USE READER SERVICE CARD ON PAGE 201 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

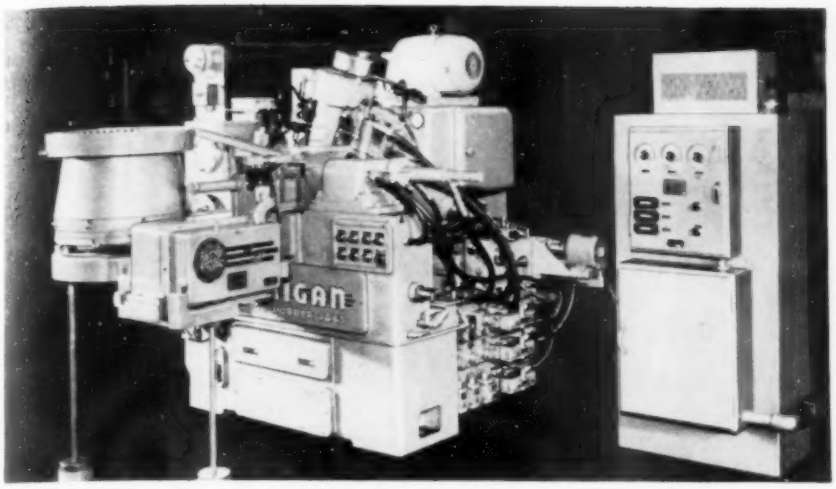
Automatic Gear Production

A high-speed hobbing machine capable of automatic production of gears within controlled specified size limits has been revealed by the Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. Constant and accurate monitoring of gear size during 100 percent of the gear production cycle automatically adjusts center distances between the hob and the gear blank to compensate for tool wear or size variation due to temperature changes.

Gear blanks are placed in the hopper-type loader and emerge as accurate size gears in minimum cycle time. Gear size tolerances are checked during production by the Michigan 3-way gear Classifier, and any variation from preset tolerances is immediately picked up by the Classifier and the proper signal relayed to the gear Controller.

The Controller automatically adjusts the hobber's center distance keeping the gear sizes within specified toler-

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-170



Versatile Cemented Carbide

Wesson Metal Corp., Lexington, Ky., has announced a new cemented carbide that is not only suitable for a wide range of machining operations on steels but outperforms the various carbides presently used in most of the operations.

Because the new metal, called Grade 26, retains its edge hardness at the high temperatures resulting from high-speed metal removal, it is particularly effective in cutting steels at higher speeds.

Primarily, the new cemented carbide was created for light, medium and heavy duty, rough and semifinish ma-

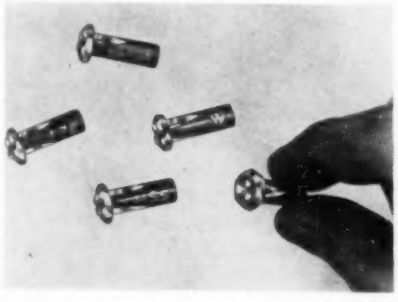
ances; keeps a statistical record of production—the number of rejects, total production, etc.; and shuts down the "production line" when the total predetermined gear production is reached, or should the helix angle not meet specifications.

The "1445 ultra speed hobber production line" has considerable flexibility. It will produce both helical and spur gears while checking each gear for undersize, oversize, correct size, eccentricity, and plus or minus helix angle. **T-4-1711**

Miniature Threading Dies

A self-contained adjustable threading die has been developed by Woodruff & Stokes Co., Inc., 353 Lincoln St., Hingham, Mass.

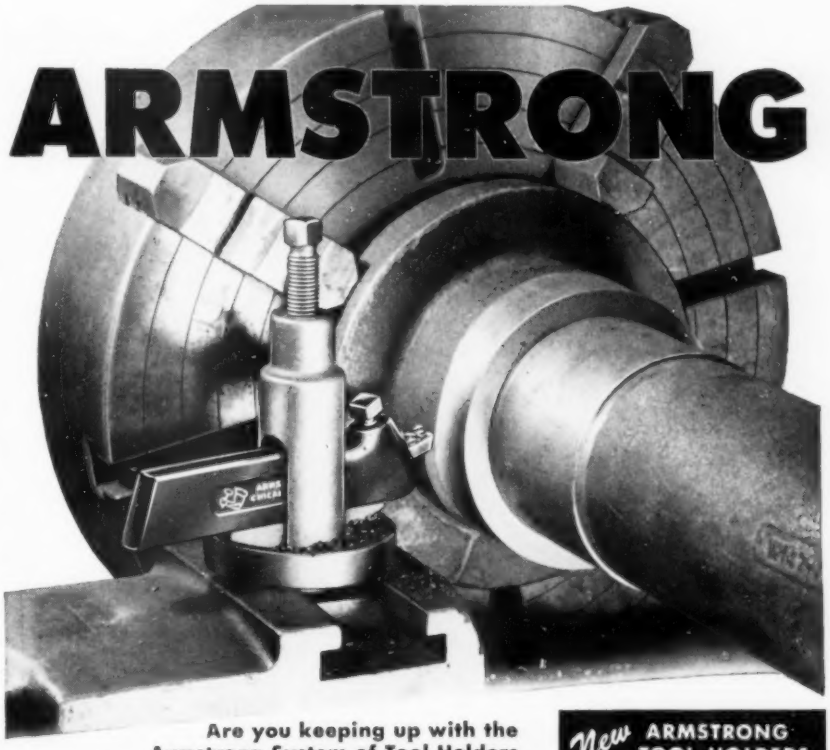
The threaded outside diameter of the cutting end of the die permits simple and positive adjustment of a hex collar



so that thread diameter may be varied over a range of 0.004 inch. Once set, the die will not change even under such severe conditions as turret indexing. The collar also permits easy removal of stock broken within the die.

W&S adjustable threading dies are available in high-speed and carbon steel, in sizes from 2-56 to 0000-360 with various pitches including metric variations. **T-4-1712**

ARMSTRONG



Are you keeping up with the Armstrong System of Tool Holders

Doubtless you are daily using ARMSTRONG TOOL HOLDERS that have been in continuous operation for many years. This is sound practice, for this means added profits without added tool costs. But to become complacent, so satisfied that you forget your ARMSTRONG TOOL HOLDERS, is unwise. The "Armstrong System" is a growing thing, with new types and sizes of ARMSTRONG TOOL HOLDERS constantly being developed to more effectively meet new machining conditions, or to take advantage of newly developed cutting materials.

With modern ARMSTRONG TOOL HOLDERS for each operation, you can greatly increase speeds and feeds. You can lower machining cost and further increase profits.

If you haven't kept up with the "Armstrong System" write for an ARMSTRONG Catalog and check to see that you are using the most efficient ARMSTRONG TOOL HOLDER for each operation on all lathes, planers, slotters and shapers.

WRITE FOR CATALOG

New ARMSTRONG TOOL HOLDERS
ARMSTRONG Spring Form Threading Tool Holder
ARMSTRONG Spring Cutting "TT" Tools
ARMSTRONG Carbide Tool Holders for Carbide-Tipped Cutters
ARMSTRONG "C-A" Tool Holders for ARMALOY (Cast-Alloy) Cutter Bits

ARMSTRONG BROS. TOOL CO. "The Tool Holder People" 5251 W. ARMSTRONG AVENUE CHICAGO 30, ILL.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-171

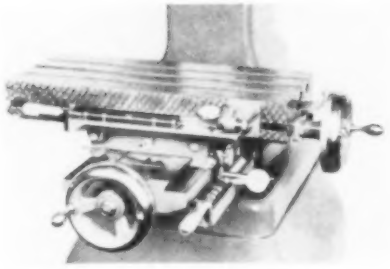
chining; it also has proved effective on some finishing work. It is designed to bracket speeds from 150-350 sfpm, which includes most commercial applications.

Under test, the Grade 26 showed gains as high as 30 percent increase in tool life, while for versatility, it proved suitable for operations formerly requiring three or four different carbide grades.

According to the fabricator, Grade 26 is available at about 10 percent additional cost. **T-4-1721**

End Measurement

End measuring rod equipment is being offered by Linley Brothers Co., 682 State St. Extension, Bridgeport 1, Conn., in connection with its jig boring



machine. The equipment consists of two troughs, two permanently mounted one-inch micrometer heads, two tenths indicators, nine end measuring rods in even inches and adjusting brackets with their adjusting screws. The $1^{1}/_{4}$-inch dials of the standard-make indicators are graduated in 0.0001 inch with 0.008 inch range for maximum accuracy with minimum effort. Nine end measuring rods, each in even inches, with an accuracy tolerance of six millionths per inch, are used.

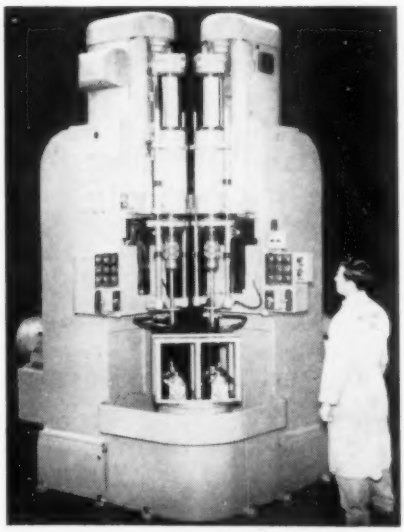
Spotting, drilling and rough boring operations are done in the conventional way by the use of the screws, using the handwheel dial readings, while only the finish boring operations are done with the use of the end measure system. **T-4-1723**

USE READER SERVICE CARD ON PAGE 201 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Vertical Hydrohoner

Micromatic Hone Corp., 8100 Schoolcraft Ave., Detroit, Mich., has developed a double-spindle vertical Hydrohoner, model 730-2, incorporating two basic units, with separate columns for each spindle.

The Hydrohoner is equipped with Microdial automatic abrasive feedout and stone-wear compensation, and Microsize automatic sizing control. It



has automatic coolant start and stop and automatic time cycle. There's a three-speed transmission assembly to control rotation on each unit. Reciprocation is hydraulically actuated, and speed is infinitely variable from 0 to about 60 sfm.

Automatic rotary index table controls are interlocked with machine controls to provide automatic indexing and operator safety. The four-station fixture makes it possible to honé two parts simultaneously while two stations are being unloaded and loaded. The same procedure can be used with one-station indexing to hone the same bore progressively, or two different bores in the same part. **T-4-1724**

NOW Quick Change Tools... for SMALL MILLS...

★ 80% saving in down time

★ Only ½ inch tool clearance needed

★ *Not* necessary to move table when changing tools

★ Eliminates loosening and tightening draw bolt

Tools completely eliminate the time lost in changing conventional type tools... Complete sets are available, write for literature covering specifications and price.

Representatives in principal cities

PDQ PORTAGE Double-Quick TOOL CO.

1054 SWEITZER AVENUE • AKRON 11, OHIO

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-172

Magnetic Drill Press

Lupear's Tool & Die Co., 32681 Northwestern Hwy., Farmington, Mich., has introduced a portable magnetically held drill press, called the Portomag, which offers particular advantages in drilling in difficult-to-reach locations.

The unit, which has drilling speed and accuracy of a standard drill press, is designed to fit between obstructions. Arranged on a magnetic plate that holds the tool firmly in place, it operates capably in any position as long as necessary.

The Portomag clings to any clean, flat, unpainted steel or iron surface, whether or not the drill is plugged in. All wiring except the power cord is concealed. The drill motor is controlled from the magnet handle position in feed and switch. Basic positions for the magnet control switch are: low, for positioning drill bit to punch mark location; medium and high for magnetic holding; and demagnetize or magnetize.

Shop tests indicate that as great as 500 lb can be suspended from the body handle of the Portomag without disturbing the operation.

Available in two sizes, small and large, the drill offers 11 and 14-in. stroke; continuous duty cycle, with drill cap (in steel with no pilot hole) of 0 to $\frac{7}{8}$ or $\frac{3}{4}$ to $1\frac{1}{4}$. Over-all sizes of the drill are 12 x 19 x 3 in. for the small unit, and 14 x 24 x 5 for the large.

T-4-1731

Reciprocating Air-Hydraulic Booster

A continuous-action, automatically reciprocating air-hydraulic booster capable of delivering an unlimited amount of high pressure fluid for the operation of hydraulic cylinders is announced by the Miller Fluid Power Co., 2040 N. Hawthorne Ave., Melrose Park, Ill.

It is especially recommended for operations requiring high holding pressure without generating heat or wear and without consuming power.

Operating from ordinary plant compressor air input, the booster offers operational advantages and cost-savings in applications where large volumes of high pressure fluid are required, although it does not build up its pressure nor discharge its oil as fast as the company's single acting B4 Boosters. Essentially, it consists of a double-rod end air cylinder with a hydraulic discharge pressure chamber at each end. Thus, it delivers a pressure output stroke in both directions.

Available in all ratios to give pressures to 10,000 psi and over, the reciprocating booster is now stocked for immediate delivery in 25 to 1 ratio units. These produce 2000 psi hydraulic output from 80 psi air input and consist of a 5-inch diameter air piston driving two 1-inch diameter hydraulic rams, each ram having a stroke of 6 inches.

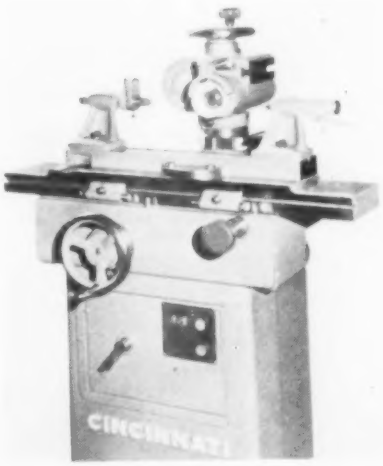
T-4-1732

Cutter and Tool Grinder

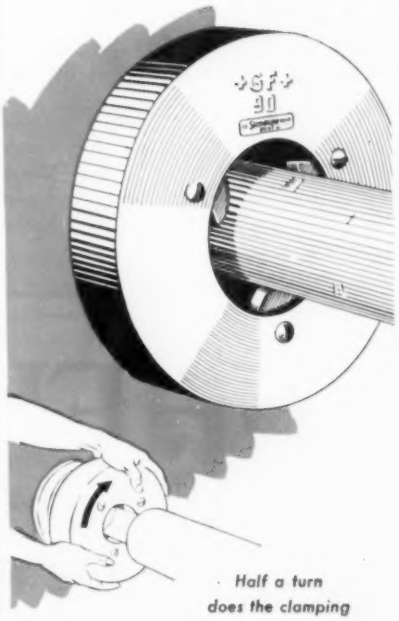
Latest addition to The Cincinnati Milling Machine Co.'s line of cutter and tool grinding machines, the No. 1 cutter and tool grinder, is designed primarily for grinding and reconditioning miscellaneous small tools and cutters. It has a capacity of 8 inch-swing and 15 inches between centers.

It has a cartridge type grinding wheel spindle mounting. The cartridge type unit may be readily replaced, thus restoring new spindle performance into the machine in an interval of minutes.

A reversible $\frac{1}{2}$-hp motor drive, built in the wheelhead, provides the proper direction of grinding wheel rotation for



SKINNER
+GF+
WORK DRIVERS



Half a turn does the clamping

- FAST
- SAFE
- POWERFUL
- EASY TO OPERATE

The Best for Turning on Centers

+GF+ Work Drivers drive smooth or rough bars and forgings located on centers. Jaws are easily reversed to accommodate direction of spindle rotation.

NOTE WIDE RANGES!

Type 36 ..... ¼" to 1 7/16"
Type 60 ..... 5/16" to 2 3/8"
Type 90 ..... ½" to 3 9/16"
Type 140 ..... 1 1/16" to 5½"
Type 200..... 4 15/16" to 8 1/16"

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THE CREST SKINNER CHUCKS® OF QUALITY

THE SKINNER
CHUCK COMPANY
212 Edgewood Avenue, New Britain, Conn.
INDICATE A-4-173

any particular grinding application. Spindle speeds (6260 or 3730 rpm) are easily obtainable from a tooth grip drive belt and sheave arrangement.

Grinding wheel collets may be interchanged quickly. Design of the machine incorporates several interesting innovations. A 360-deg eccentric wheelhead swivel adds 3 inches to the conventional cross range of $4\frac{1}{2}$ inches, facilitating surface grinding operations, and assuring ample capacity for grinding large diameter cutters requiring the full 8-inch swing capacity of the machine.

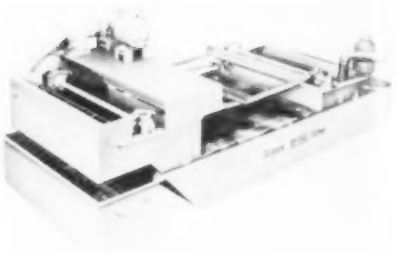
The double-end antifriction spindle of the universal workhead accommodates No. 12 B & S (No. 5 Morse optional) taper shanks on one end and No. 50 Series National Standard on the other end.

A wide variety of attachments extend the range of the machine for sharpening miscellaneous small cutters including those of sintered carbide.

Publication M-1852, containing complete specifications and engineering data on the machine may be obtained from the company, Cincinnati 9, Ohio. **T-4-1741**

Filtering Equipment

Fine as well as coarse particles are filtered from liquids through a permanent filter medium incorporated in the automatic self-cleaning industrial filtration unit developed by Industrial Filtration Co., Dept. U-298, Lebanon, Ind. This Delpark Up-Flo filter utilizes gravity to remove the heavier solids before filtration of the liquid through a horizontal bar-type screen and only fine particles held in suspension reach the screen.



Chain driven flights operating on a time-lapse sequence pass under the filter and remove deposits from the underside of the screen and the area beneath the screen. These flights carry the particles to a device which cleans the flights. Filtered swarf drops into a tote box for disposal.

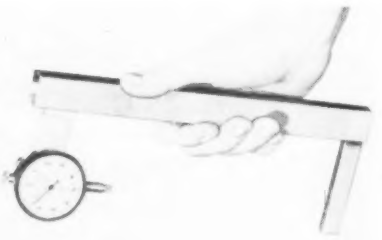
Efficiency is maintained on high capacity and full flow. All sizes, flows and capacities are available. **T-4-1742**

USE READER SERVICE CARD ON PAGE 201 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Gage Block Accessories

The DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill., has developed a system of square block accessories designed to extend use of all standard square gage blocks in ordinary inspection tasks. Excellent surface finish contributes to easy wringability, minimizes wear and assures significantly longer life.

Features include: unusual ease of



assembling square blocks into working gages; assembly of a wide variety of gages; assemblies permit inspection by indication rather than by "feel."

Tie rods for assembling stacks of blocks interlock at $\frac{1}{4}$-inch increments. A base block $2\frac{1}{2}$ inches square provides surface area large enough to accommodate as many as four gage assemblies.

Flat caliper jaws with 1 and 3-inch

SHELDON
CHICAGO U.S.A.

Sheldon's larger, wider "Zero Inspection", Tapered Roller Spindle Bearings save you money by making these lathes better in 6 ways.

Write for G-55 catalog showing new 10" 11" and 13" swing, bench, cabinet and pedestal mounted Sheldon Precision lathes.

1st They *meet* Sheldon's high standard for accuracy—each bearing has a run out limited to .00015"

2nd They absorb thrust and radial loads beyond requirements—basic rating on front bearing at 500 R.P.M.
for radial loads.....3540 lbs.
thrust loads.....2335 lbs.

3rd They *end* costly bearing maintenance—require only a fractional turn of bearing take-up after long periods of service.

4th They *hold* the spindle in rigid alignment while permitting it to turn freely at high or low speeds—the line contact between rolls and races, and the opposing taper design, preclude lateral movement or end play.

5th They *minimize* friction—smooth mirror finished rollers and races running in light oil, deliver more horsepower at the Spindle Nose and lower power costs.

6th They *increase* work capacity. Larger than similar type bearings on other lathes in this price range, these bearings make it possible to turn out *more work* and *better* work at lower costs.

SHELDON MACHINE CO., INC.
4229 NORTH KNOX AVE. • CHICAGO 41, ILLINOIS
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tensions permit checks of outside diameters up to 6⅞ inches. Round caliper pins, available in 0.100 and in 0.200 inch, held in the assembly with specially designed V blocks, check inside diameters.

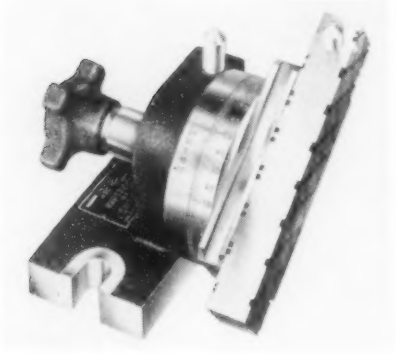
An important development of the system is the accessory set for assembling indicating square block gages. Specially drilled and tapped gage blocks accommodate brackets for holding dial indicators in several positions so that they can be used an pin gages, comparators or height gages.

T-4-1751

Angle Dresser-Toolholder

A versatile double-duty tool that serves either as an accurate angle truing wheel dresser or as a precision toolholder has been developed by Rothfuss Tool Co., Box 202, Elmwood Station, Providence, R. I.

As an angle dresser, the tool, called



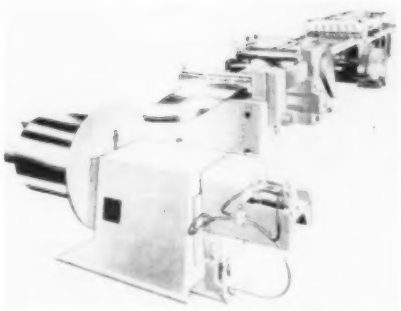
the Rothfuss G-2, has a graduated easy-to-read vernier scale ranging from 0 to 180 deg. that can be set to within 5 minutes of one degree in seconds.

The tool offers both accuracy and speed as a toolholder. It can be set up quickly to any desired clearance angle without wrenches. Tool bits up to 1 inch square are held throughout an operation. **T-4-1752**

Decoiling and Shearing

Dahlstrom Machine Works, Inc., 4227 W. Belmont Ave., Chicago 41, Ill., has developed a unit which permits the use of coiled material instead of flat stock. The machine, called Dahlstrom's Shear Line, consists of hydraulic expandable mandrel coil reel, roll straightener with all rolls power driven, hump table, high-speed shear, conveyor-type measuring and take-off unit.

Various operations it performs include decoiling, flattening, shearing and measuring the metal to desired length.



Steel or aluminum of 12 gage and lighter can be handled up to 72 inches wide. Lengths can be cut to specific requirements with tolerances of 1/32 inch. Variable speed permits a range from 50 to 150 fpm. The unit can be equipped for edge trimming as well.

T-4-1753

Safety Attachment for Press Brake

An electromagnetic back gage safety device has been developed by American Actuator Corp., 219 E. 44th St., New York 17, N. Y. to prevent press brake accidents. In use, the attachment positions the work correctly at all times. It is easy to install and operate and can be readily adapted for use on power presses, rolls, etc.

This AAC magnetic back gage holds material while the ram is in motion. The operator does not have to "feel" whether the sheet is against the back stop since it is magnetically drawn to it. With it, one man can handle large sheets easily and safely.

Accuracy is constantly maintained because the magnetic force draws the material evenly to the gage and holds

Dull Taps throw Real Money out the window

Blake "TAPSAVER" equipment brings this money back.

Accurate flutes, relieved chamfers, correct rake angle produce long, free-cutting tap life.

Blake Grinders keep your taps in *better-than-new* condition, and bring you top hole threading economy.

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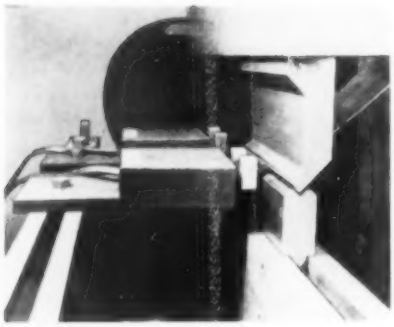


it securely. Since the metal is always precisely positioned, production is uniform in any press brake operations, including multiple punching.

The gage will also form several pieces simultaneously and two separate operations—even with the use of two dies—can be performed by one operator at a single stroke of the ram.

Current to the AAC magnetic gage block is automatically supplied by a magnetic gage control. Accessories provide for sequence control in step gaging and single pushbutton control to permit turning magnets on or off at will.

T-4-1761

Universal Stainless

Development of universal stainless steels has been announced jointly by Michigan Steel Casting Co. and WaiMet Engineering Co. These U steels are based upon techniques of closer metallurgical control than have been possible previously, so that one analysis now meets the various specifications.

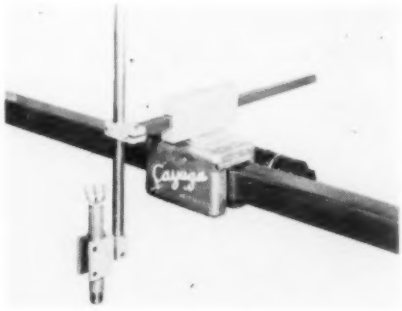
Stainless steel Master alloys—refined, prealloyed metals specifically designed for remelting to product precision castings—are now in production at Michigan Steel Casting Co. in Detroit, and are also being stocked at the WaiMet Metals plant in Glendale, Calif. for use by the precision foundry industry.

Master alloys are furnished in three shapes—slugs, ingot and shot. Details are available from WaiMet Engineering Co., 1999 Guoin St., Detroit 7, Mich.

T-4-1762

Portable Seam Welder

Seams from five to twenty feet long can be welded with the portable seam welder announced by the Cayuga Machine and Fabricating Co., Inc., Depew, Buffalo, N. Y. This self-contained unit,



with its own rail supported by either tripods or magnetic clamps, is easily handled by one man and is designed to take the welder to the workpiece, eliminating setup time. Speed range provided is 15 to 1.

A Cayuga-Matic seam follower has been designed specifically for use with his seamer.

T-4-1763

For...

General-Purpose Sawing

with

High Speed

Accuracy, Economy

Model 4B/M2/E2
Equipped with standard work track
(Optional Equipment).

MARVEL No. 4B

HIGH SPEED HACK SAW

Exclusive features

1. Horizontal Ball Bearing Saw Frame.
2. Screw Feed—Automatic or Hand Driven.
3. Quick Return Stroke—allows greater number of strokes per minute.
4. Simple Positive Coolant System.
5. Adjustable Stroke—can be shortened for larger capacity.
6. Speed Range—available in 1, 2 or 4 speed models for wider range of work.

Let us prove to you the many reasons why this MARVEL Hack Saw offers the cheapest, most accurate and fastest "cut-off" method available to you at a low initial cost.

Ask your dealer, or write us for Bulletin GP35 which fully describes and illustrates the many exclusive features which makes this Hack Saw Machine your "best buy".

MARVEL Metal Cutting SAWS

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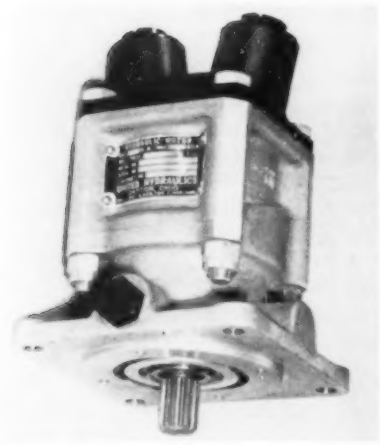
Hydraulic Motor

Nine axial pistons operating against an inclined hydraulically balanced thrust plate are contained in the hydraulic motor designed by United Hydraulics, Inc. 110 Terrell Ct., Dayton, Ohio. A shaft supported by antifriction bearings provides a dynamically stiff drive to a rotating barrel containing the pistons. The motor is enclosed in a split housing with inclined mating faces designed for simple assembly. Low moment of inertia permits rapid reversibility.

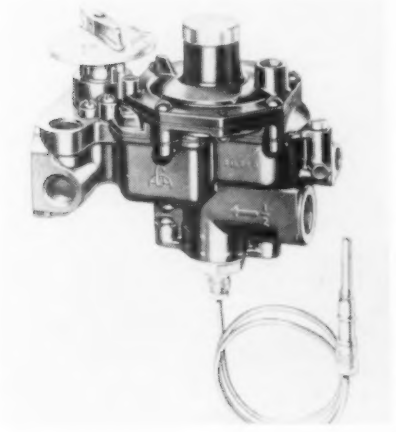
Two production models, of 0.348 and 0.510 cu in. revolution displacement and



6.0 and 7.0 lb weight, are rated at 4000 rpm and 3000 psi continuous and develop 9.7 and 14.6 hp respectively. Developed torque is 163 and 236 in-lb respectively. The 0.510 cu in. motor has a peak over-all efficiency of 94 percent. Over-all dimensions are 3 inches square by $4\frac{3}{4}$ inches long for the small motor, and $5\frac{1}{4}$ inches long for the larger. Variations in installation features for aircraft or industrial application can be accommodated. **T-4-1771**

Heater Control

A-P Controls Corp., Milwaukee, Wis., has designed a Model 55 Gasapack heater control for modern, high efficiency gas equipment. Features are its economical installation and operation. The self-contained unit comprises five



controls: a built-in pressure regulator for city gas; a large pilot filter; a 100 percent automatic pilot; and main and pilot shutoffs.

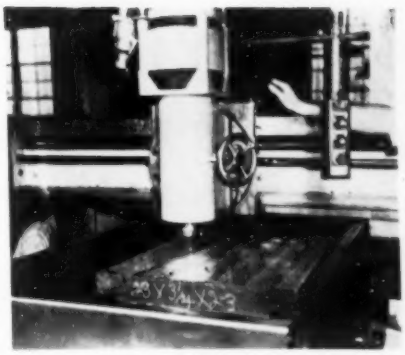
Three automatic accessories, 55 MTS modulating snap thermostat, the 55MT modulating thermostat and the 55ET electric thermostat, give the Model 55 flexibility and provide simple selection of ideal temperature control. **T-4-1772**

Milling Head for Planers

A motorized spindle for conversion of planers and old milling machines to high-speed carbide milling is offered by the Detroit Milling Cutter Co., 28625 Grand River, Farmington, Mich., for use with their indexable carbide milling cutters.

Drive is by a 20-hp, 1200-rpm motor, directly connected to the rotor of the motor, thus doing away with all gears. Vertical adjustment is by ways.

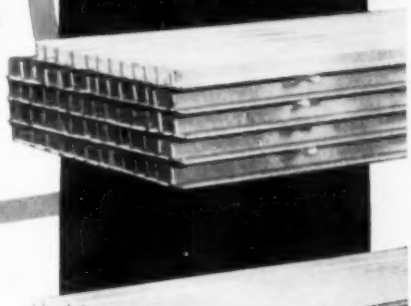
A choice of four table feeds ranging



"Helicarb" Cutters jump production 2¼ times!

...at Convair Division, General Dynamics Corporation, San Diego

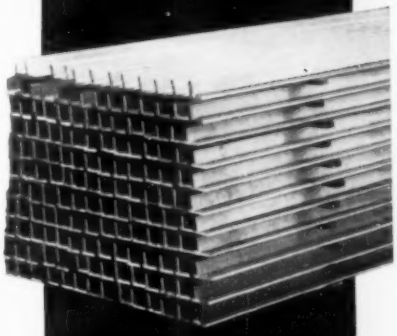
Conventional method: 68 spars in 37½ hrs.



Improve finish; eliminate handwork!

"Helicarb's" cutting angle is constant over the full length of the flute, producing a unique, shearing cutting action. Chatter and impact is sharply reduced, resulting in less crumbling of the carbide and finishes of 20 r.m.s. and better. Proper chip flow design reduces recutting, giving 2 to 3 times more production between resharpening.

Your "Helicarb" distributor has complete data.



With Helicarb Cutters: 154 spars in 37½ hrs.

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Sonnet Tool and Mfg. Co.

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INDICATE A-4-178

from 30 to 120 ipm is available to the operator and a Loadmeter device will shut off the feed motors if the spindle is seriously overloaded.

As auxiliary equipment, a constant feed device insures that on irregular surfaces the spindle is working at top capacity at all times without the risk of cutter breakage.

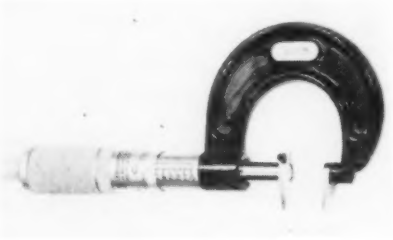
A standard 4-inch Futurmill cutter having 8 octagonal solid carbide blades (illustrated) is being used to machine a 23 x 23 mild steel block to a depth of ⅛ inch with seven cuts at 60 ipm.

Octagonal blades in the Futurmill cutter can be quickly indexed when dull so as to set up a new cutting edge.

T-4-1781

Micrometer

Either spur or helical gears having an odd or even number of teeth can be measured with the simple, accurate micrometer introduced by Sensory Devices Co., P. O. Box 204, New Vernon, N. J. The tool, which was especially developed for span measurement of gears, requires no master gears or accessory pins or balls.



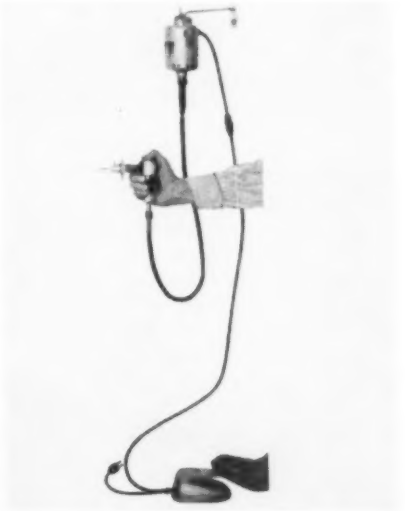
The instrument has a nonrotating spindle, a friction thimble, and a 0.0001 inch vernier graduation that is standard on all sizes.

T-4-1782

Finishing Tool

Nord International Corp., 449 E. Central Ave., Orange, N. J., which makes the precision Di-Profiler for hard-to-reach work, announces that the tool now has an improved foot control for providing the desired stroke speed by simply raising or lowering the foot, like the accelerator of a car.

The control is a carbon-type rheostat that regulates the number of strokes of the Di-Profiler from 0 to 15,000 per minute. The foot control may be used with the tool whether it is doing reciprocating, oscillating or rotary action.

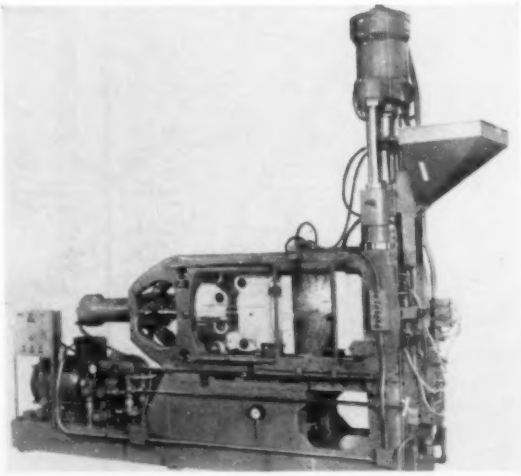


The universal motor may be plugged into any 110-220 volt receptacle and used continuously without overheating. The Di-Profiler itself has a compensation spring within the head extension that provides positive action without breakage on such work as finishing dead end holes or concavities.

T-4-1783

Molding Machine for Plastic Materials

A 12-ounce machine with greater locking tonnage and extra large mold area has been introduced by Lester-Phoenix, Inc. This model, the L-2-12, will mold 12 full ounces of polystyrene or 46.2 cubic inches of any other granular thermoplastic material. The machine combines maximum daylight for deep draw parts with unusual plasticizing capacity.



In the injection end, the machine features a vertical injection assembly, hinged for easy access, patented

ternally heated cylinder with narrow nd heaters on the outer wall and four ne pyrometer control. The high speed the plunger can be adjusted, and the irection pressure control is within easy ach of the operator. The plunger dvance circuit for faster cycles and a o-minute booster timer are included.

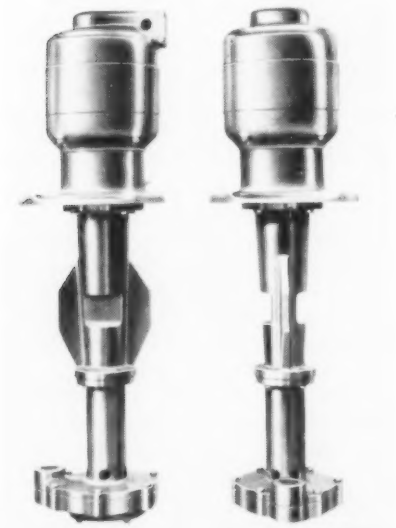
Beam area is equivalent to 6½ tie ars. One-piece cast steel frame, it has 00 tons of preload clamping.

The L-2-12 is readily adapted to ylon molding. Special purpose acces- ory circuits, such as completely auto- natic molding, are available at cus- omer's request. For complete specifi- cations write Lester-Phoenix, Inc., 2711 Church Ave., Dept. N-31, Cleveland 13, Ohio. **T-4-1791**

USE READER SERVICE CARD ON PAGE 201 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Gusher Pump

The Ruthman Machinery Co., Read- ing Road at Deer Creek, Cincinnati 2, Ohio, has introduced the Model 'TL-15025K' gusher pump, arranged for center coolant trough mounting on trav- eling base machine tool installations. The tapered tubular housing is pro-



vided with a reinforced narrow section for passage through the limited width slot in the trough cover. The pump has no packing glands nor metal-to-metal contacts below the liquid high level line. Thus liquids contaminated by dirt, grit and abrasives can be safely han- dled without injury to the pump which is provided with sufficient clearance to permit free passage of such liquids.

The built-in electric motor is avail- able in ½, ¾ and 1 hp sizes. **T-4-1792**

Fluxing Unit

An automatic fluxing system an- nounced by All-State Welding Alloys Co., Inc., 249-55 Ferris Ave., White Plains, N. Y. for production and main- tenance brazing operations, meters liq- uid flux into the fuel gas according to size of brazing tip and regulator pres- sures.

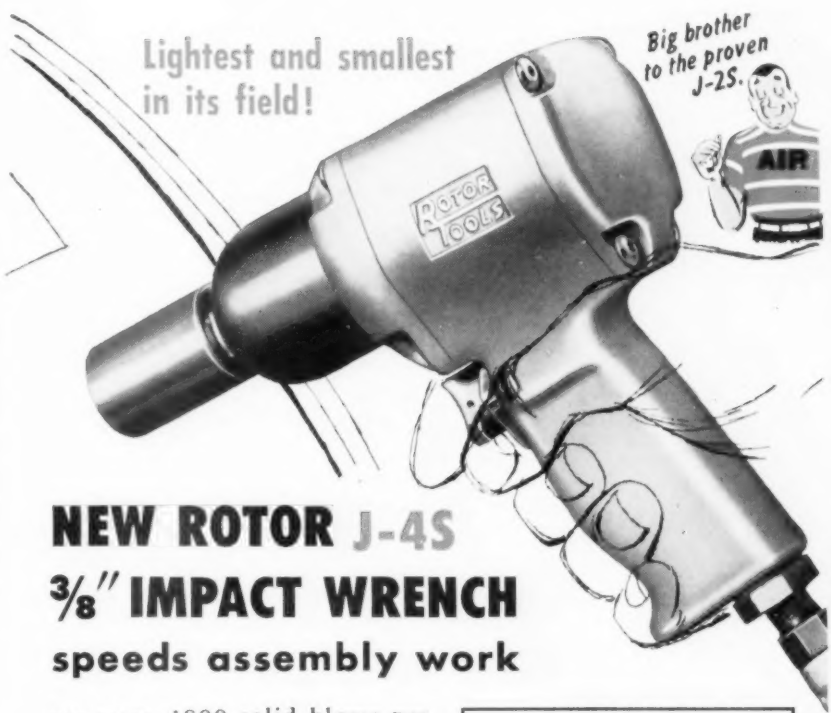
The new Jet Flux liquid, and the Jet Flux auto-dispenser were created primarily for production brazing of carbon and low alloy steels, brass and copper base alloys, and monel. It can also be used in surface silver brazing, and as an "assist" for socket brazing with silver. The unit is compact, simple, and sized to carry a charge for a work- week of brazing operations. **T-4-1793**

Coil Winder

The MidJet Toroid winder has been developed by Electro Devices Co., Inc., an associate of Atlas Tool & Machine Co., for winding small toroid coils hav- ing an inner diameter when finished of ⅛ inch.

The miniature winder measures only 9½ inches in length. Wire sizes from #30 to #44 can be wound on closed magnetic cores of wound tape, stacked ring punchings or molded powder. Winding speeds range from 400 to 600 turns per minute regardless of wire size.

Manual rotary core feed allows either clockwise or counterclockwise progress of the winding. Layer winding may be done by continuous core advance in



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⅜" IMPACT WRENCH
speeds assembly work

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SPECIFICATIONS
J-4S Impact Wrench (Side Handle)
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Drive (Standard) . . . . ⅜" square drive.
Optional ½" square drive or 7/16" female hex quick-change chuck.
Hose connection . . ¼" pipe

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one direction, or bank winding is possible by reversing the core feed at intervals.

For further details, write to Electro Devices Co., Inc., 463 Commercial St., Boston, Mass. **T-4-1801**

Production Bench Gage

Rapid precision checking of parts in any quantity is easily accomplished with Model BG103 Geneva production bench gage made by the Chicago Dial Indicator Co. A convenient hand lever quickly lowers a hardened steel table to permit entrance of the part to be checked. Because the indicator plunger need not be raised to give adequate work clearance, unnecessary dial indicator wear is avoided. Accurate repeat reading is assured by a positive stop spring return.

For work requiring use of both hands, a foot pedal attachment may be fitted. Model BG103 of the Geneva bench gage is regularly supplied with the No. 135 F Geneva dial indicator, a balanced dial with a range of 0.125 inch in 0.0005-inch graduations. However, any Geneva dial indicator with graduations ranging from 0.001 to 0.0001 inch may be used to meet particular checking requirements.

Vertical capacity of the unit is $1\frac{3}{8}$ inch with a maximum throat capacity $2\frac{13}{16}$ inches from the column to the center of the table. The table is $1\frac{13}{16}$ inch in diameter and has a travel of 0.300.

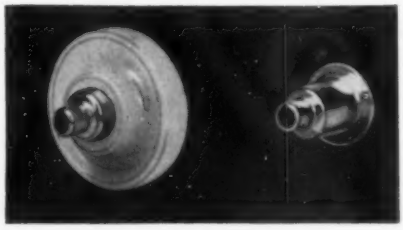
For refined positioning of the table to the indicator a Model BG103-A is offered with a 1-inch micrometer adjustment. Other specifications are the same as on the Model BG103.

Detailed information, specifications and prices may be obtained from the manufacturer, Dept. L, 180 N. Wacker Dr., Chicago, Ill. **T-4-1802**

Drawn Steel Stud

The Waterbury Pressed Metal Co., 300 Chase Ave., Waterbury 14, Conn., has added to its line a drawn steel stud that provides ample strength at lower cost for many applications now requiring a solid stud.

Known as Roll Free, this drawn steel stud for roller mounting offers unusually smooth bearing surfaces. The new stud, pictured alone at right and assembled in a nylon roller, left, is available from stock in four standard sizes. Other sizes are made to specifications. They are available plated or in clean finish, and in either brass or stainless steel for applications where corrosion is a factor. **T-4-1803**



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Tungsten Carbide Tipped Cutter precision bores three diameters in aluminum gear case.

Radial Drive Tungsten Carbide Tipped Cutter bores gear pocket in oil pump.

Multi-diameter cutter with Tungsten Carbide Tipped inserted blades for boring, counterboring and chamfering.

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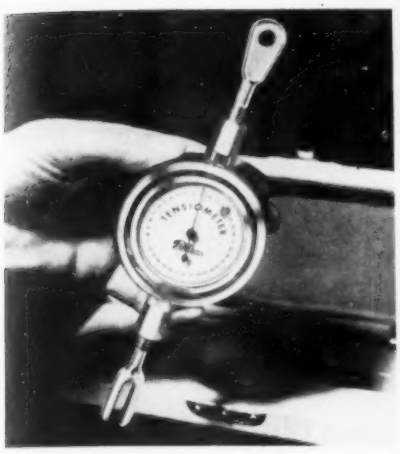
Elastic Proving Rings

A 0-300-lb capacity turnbuckle type proving ring has been introduced by W. C. Dillon & Co., Inc., P. O. Box 2008, Van Nuys, Calif.

In addition to reading tensile or compression loads with extreme accuracy, the new instrument can also be em-



ployed to apply a tensile load by simply taking up on the turnbuckle forks at opposite sides.

For maximum accuracy, the Dillon proving ring is furnished with a dial graduated in angular degrees. Translation of readings into pounds is on a separate calibration reference chart.

Increment marks on the 2-inch diameter dial are in 2 degree steps. Accuracy is held within plus or minus 1 percent of the indicated reading. For compressive use, the turnbuckle forks are unscrewed, and load is applied against the flats of the bosses.

T-4-1811

USE READER SERVICE CARD ON PAGE 201 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

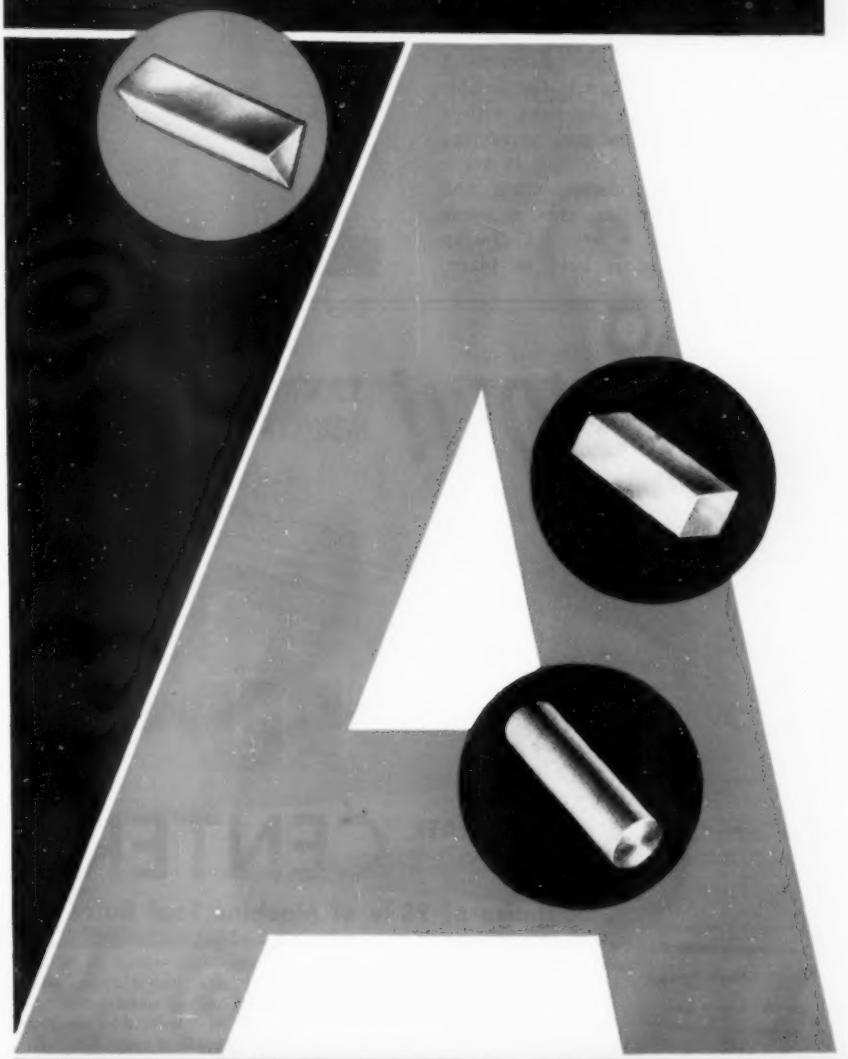
Hardness Tester

A precisely accurate instrument designed for measuring both standard or superficial surface hardness of thin shells and cylinders without damaging tested work or requiring use of test coupons has been developed by Arde Associates, 14 Williams St., Newark, N. J. The instrument incorporates surface indenters suitable for obtaining Rockwell B or Rockwell C hardness as desired.

The unit may be applied to cylindrical shells open at both ends or open at one end only, while special models are available for measuring surface hardness of large curved sheet metal parts and for oddly shaped articles.

T-4-1812

Endurance Insurance for your tools



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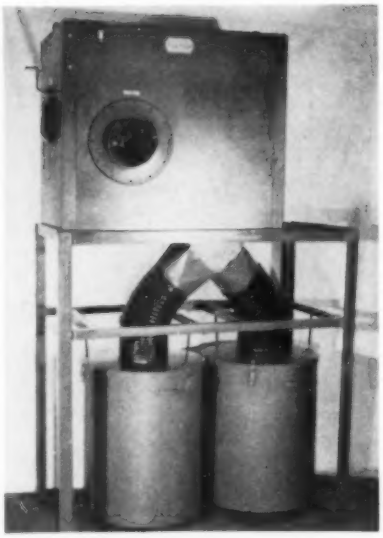
Dust Collector

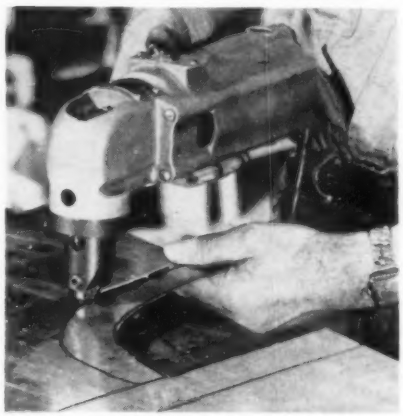
A more efficient and easily maintained dust collecting unit has resulted from design changes made in Aget Mfg. Co's. Dustkop Model 11w50. The overall height of the unit has been reduced by approximately 10 inches because the standard dust bin has been eliminated and filtered dust, shavings, chips, or lint are now dropped directly into selected collecting roller cans. The two roller cans plus the diversion Y also have been redesigned; the flexible diversion Y provides the cans with a better, more permanent seal, permitting dust to flow more freely and to settle faster. Connecting, disconnecting, and removal of dust roller cans is made easier because of a new lid closing principle. The lid is held in place, during operation, by three easily operated clamps. Lid and Y connection are self-suspending during roller can removal and cumping operations. Details may be had from Aget Mfg. Co. Adrian, Mich. **T-4-1821**



Light-Duty Nibbler

Introduction of a light-duty Nibbler has been announced by Fenway Machine Co., 263 N. 23rd St., Philadelphia, Pa. The new model handles stainless steel up to 18 ga; milder steels and other sheet stock up to 16 ga.

Particular advantage of the Nibbler is that it cuts irregular, rounded or special shapes easily, and will cut contoured stock without damage to the original contour.



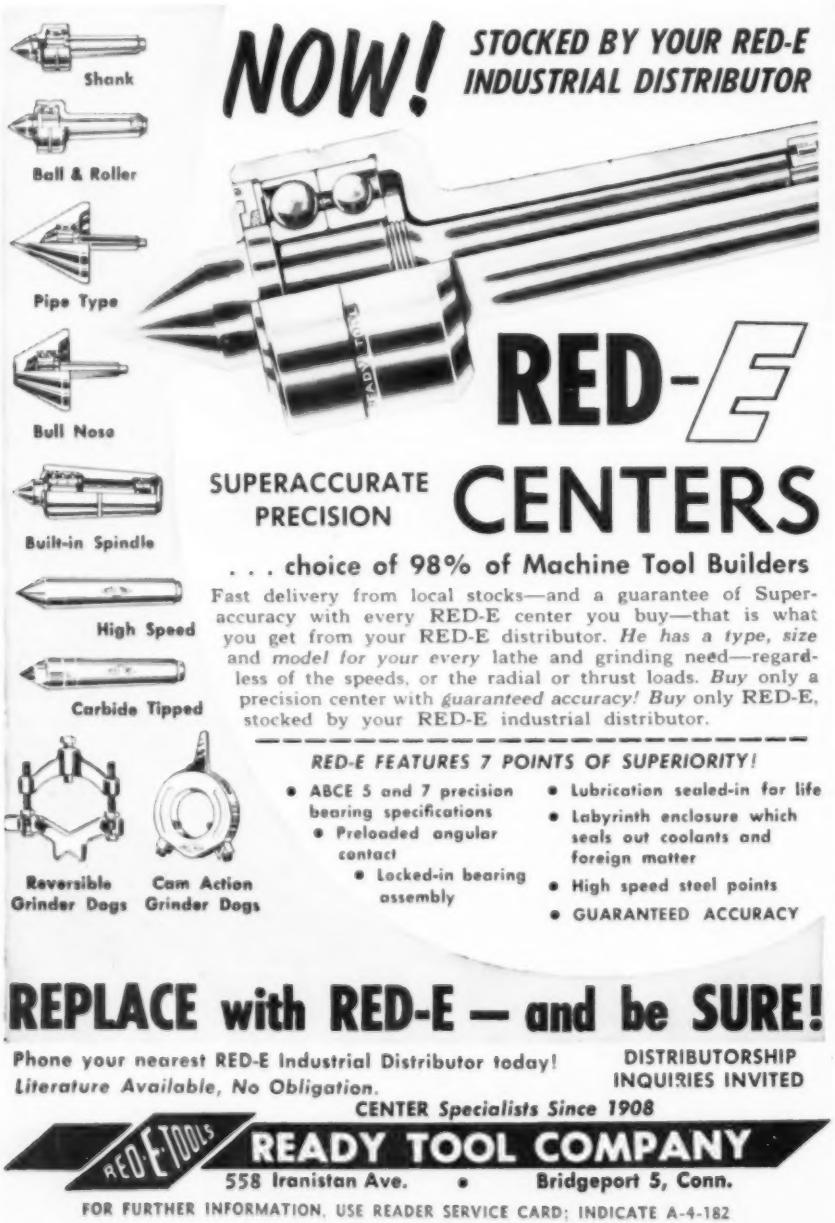
Portable and light in weight, the Nibbler is easily maneuvered as a hand tool or can be vise-mounted for bench operation. At maximum load, it cuts at the rate of 43 ipm, from any angle, with a minimum cutting radius of 7/8 inch. The punch and die are replaceable and can be sharpened as needed.

A special head is available for cutting corrugated metals and a 90-deg die holder for the heavy-duty Nibbler permits the operator to make a square corner on a 90-deg turn, without scrap loss. **T-4-1822**

Marking Machine

Rolling marking on the periphery of shells, cups, tubes and other parts whose walls will not support marking without an arbor or stud, can be done with the Model 135 Rotary Marking Machine, designed and built by George T. Schmidt, Inc., 1810 Belle Plaine Avenue, Chicago 13, Ill.

The unit illustrated here is used for rolling data on the periphery of condenser cans for radii. Although units or parts to be marked vary both in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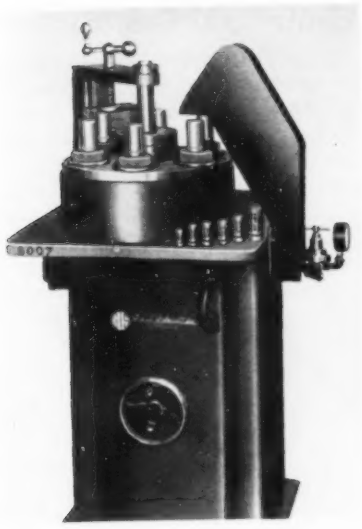


diameter and in length, they may be marked on the same machine, using interchangeable studs.

Parts are placed over fitting studs mounted on a revolving table which rotates them against a concave lettering die. Stud adjustment to the lettering tool is simple.

Parts are ejected after marking either by means of a synchronized air blast through a hole in the stud as the part passes under an inverted discharge chute, or by means of a sweep arm which brushes parts from the table after studs recede by a cam action.

Other features of the unit are variable speed control, automatic counting, and pneumatic die cushion to compensate for variations in wall thickness. Estimated production of the marking machine is from 3500 to 3850 parts per hour. **T-4-1831**

Air Vise

Addition of Model 44 air vise to its line of vises and locking mechanisms has been announced by Heinrich Tools, Inc., Racine, Wis.

Gripping with a force 15 times air line pressure, the larger 4-inch jaw width is infinitely adjustable to a maximum opening of 4¼ inches, with maximum travel of ⅜ inch. The vise operates from either air line or compressor at a maximum operating pressure of 150 psi. An air regulator permits grips ranging from a feather light touch to a strong squeeze.

A foot pedal control leaves operator's hands free for rapid work. Positive, fast-acting control results in greater accuracy, increased production in less time. The pedal keeps vise jaws open or closed without constant foot pressure. Design of the mechanism makes it fast and easy to set. **T-4-1832**

Step Cutters

Onsrud Cutter Mfg. Co., 800-820 E. Broadway, Libertyville, Ill., has announced a carbide tipped step cutter for machining wood, plastics and nonferrous metals.

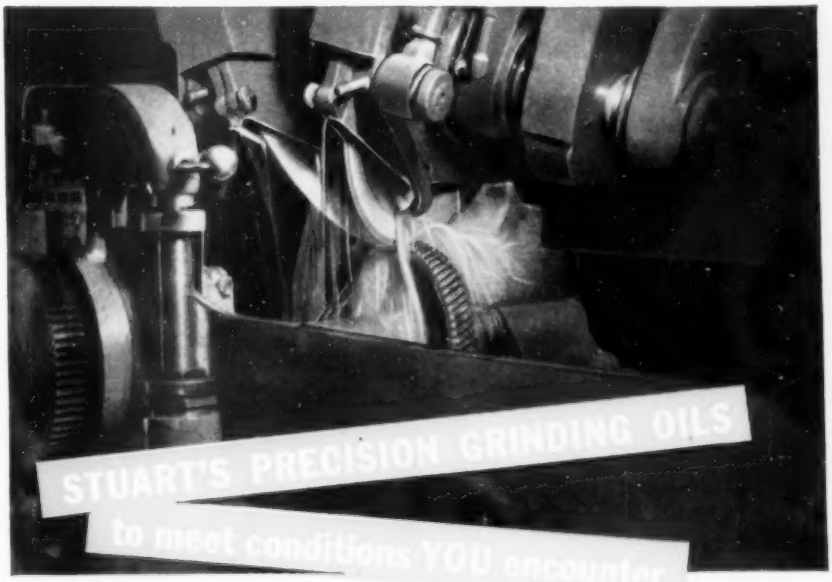
The step cutters, which offer economy, efficient performance and versatility, may be resharpened or retipped at a nominal cost.

Cutters are staggered on the spindle forming steps, giving intermittent cuts, allowing for faster feeds, smooth finish and reduced machine spindle strain. Cutters may be stacked to any height. If so desired, cutters could be ground with side clearance so that they may be used for slotting, grooving or other operations. **T-4-1833**

Automatic Tapping Head

Fully automatic or semiautomatic leadscrew tapping on any drill press in either metal or plastic is the main feature of the Auto-Tap heads recently introduced by Automatic Methods Inc., 965 W. Grand St., Div. 204 A, Elizabeth, N. J. Standard Bellows air motors and Electroaire valves activate the clutch mechanism. Although a fixed return micro-switch impulse completes the cycle, the starting impulse can be arranged according to the user's needs.

The leadscrew assures production of consistently good threads in most materials. Because the leadscrew takes all end thrust and guides the tap in all directions, tap breakage is minimized. Positive mechanical depth control per-



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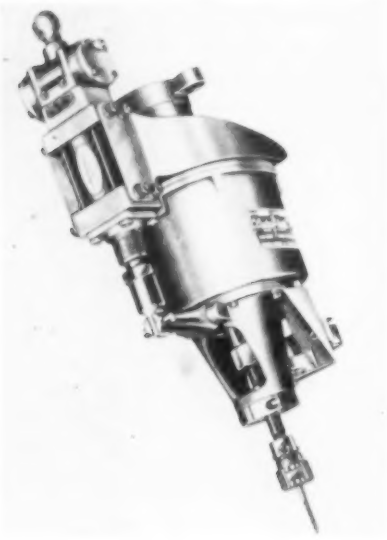


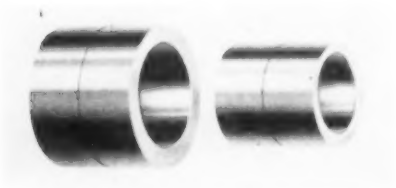
mits blind holes to be tapped safely and accurately.

Attaching readily to the quill of most standard drill presses, Auto-Tap heads can be used as tapping stations on standard or special purpose production machines. Two models are available: Model 800 for tapping sizes #0-5/16 inch; Model 900 for sizes #10-3/4 inches.

T-4-1841

Hole Adjustment Liners

A precision-made, adjustable, interlocking liner, consisting of two mated eccentric parts capable of adjusting the location of a hole center as much as 0.062 maximum, has been announced by Lee Liner Co., 107 Sierra St., El Segundo, Calif. Slip fit of 0.0003 for



positioning gives precise, easy adjustment. After positioning, the parts are pushed together with a press fit of 0.0015 for locking. Adjustability of the Lee liner permits use of a drill press operation rather than a more expensive jig boring setup, allowing correction of minor errors or the relocation of holes within its capacity. In experimental work, the liners may be pushed out and readjusted to new positions.

T-4-1842

Centrifugal Castings

Janney Cylinder Co., Holmesburg, Philadelphia, Pa., has made available stainless steel rings, rolls, bushings, sleeves and liners centrifugally cast in precipitation-hardenable, corrosion resistant alloy, type V2B. The items are produced under license from Cooper Alloy Corp. of nickel-chromium-copper-molybdenum alloy which combines high hardness, nongalling characteristics and superior corrosion resistance. Besides its practical use in corrosive atmospheres and solutions, V2B does not overage at elevated temperatures so may be used safely in steam applications at temperatures to 1400 F.

The alloy is readily machinable in the quench-annealed state and may be hardened by a low temperature heat treatment which produces no distortion and only an easily removable light heat tinting discoloration. In the annealed condition, the material is easily welded.

T-4-1843

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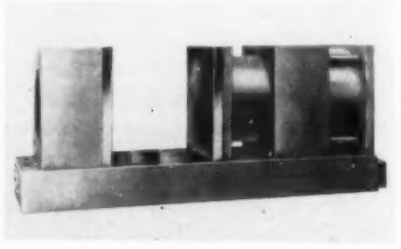
Air Powered Clamp

A heavy-duty air-powered clamping device called the Vi-Speed Autovise, Model 663, is announced by Van Products Co., 5789 Old Ridge Rd., Swanville, Pa. Characteristics are its 6 x 6-inch deep jaws, backed with a large 4-3/4 inch diameter push rod, providing exceptional rigidity. It may be used in



any position and is adaptable for milling and holding for drilling and tapping, as well as being suitable as a bench type platen press.

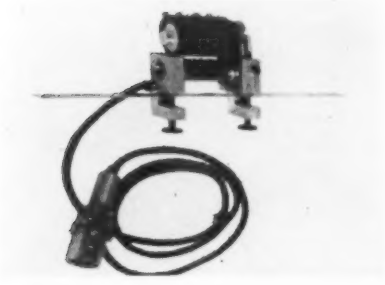
Jaws open to 8 inches on standard units, and larger openings are available. Power is by spring return air cylinders which have 19:1 ratio on any line pressure to 150 psi, with 3-inch air stroke. The stationary jaw is adjustable to 3 positions for holding materials up to 8 inches in width. Jaw faces are removable, and can be drilled and tapped for fixtures and die attachment.

T-4-1844

Strain Gage

A nonaveraging, screw-on separable transformer, or miniature variable transformer-type extensometer for use on ½-inch wide flat specimens 0.005 to 0.50 inch thick with 2-inch gage length is announced by Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.

This extensometer, the Model P-2-MS, is intended for use with Micro-



former-type recorders to produce stress-strain curves up to failure of specimens that exhibit brittle type fracture. Strain magnifications are 250, 500 and 1000 to 1 with a measuring range of 0.05 inch.

The new extensometer is made of two separable telescoping parts, each with screw clamp for attachment to specimens when tubular members of the extensometer are fully telescoped. Telescoping of the two parts of the extensometer establishes the initial starting gage length on the specimen, making prick punches unnecessary.

T-4-1851

Adjustable Vibration Mount

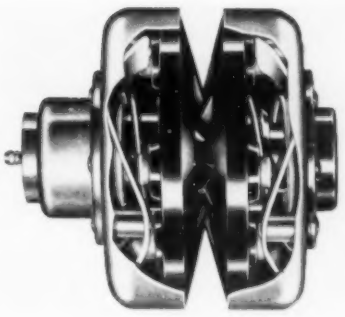
Adjust-O-Mount, W139, an all-metal mount featuring a simple built-in leveling device that permits installation of machinery quickly and correctly without the use of special tools, is announced by Robinson Aviation, Inc., Industrial Div., Teterboro, N. J. Leveling and aligning of equipment is done in a matter of minutes, regardless of floor evenness.

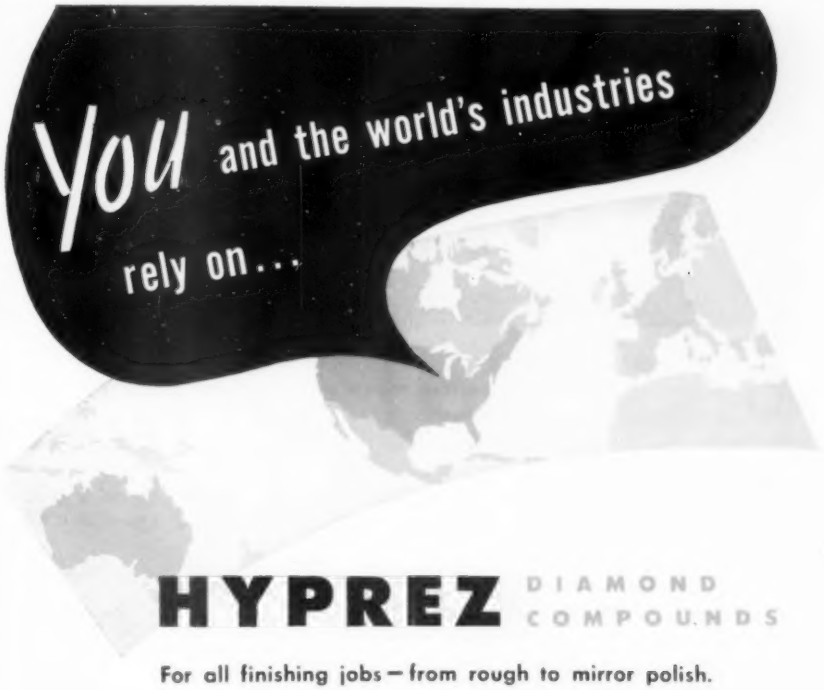
Engineered to meet standards of shock and vibration control, the mount offers stability to practically all types of machine tools. Equipment so mounted need not be bolted or lagged to the floor. Exposure to oil, water, solvents, dust, or extreme temperatures will not affect its performance. **T-4-1852**

Variable Speed Pulley

Infinitely variable speeds from a constant speed motor are possible with the new Hi-Lo automatic pulley built for use on motor-driven appliances by Dept. KP, Equipment Engineering Co., 2853 Columbus Ave., Minneapolis 7, Minn.

Unusual feature of Hi-Lo pulleys is the cam and cam follower assembly on the back of the pulley faces which serves to adjust automatically to main-





HYPREZ DIAMOND COMPOUNDS

For all finishing jobs — from rough to mirror polish.

HYPREZ, the original Diamond Compound, is available in types and grades for every finishing requirement; in 18- and 5-gram sealed cartridges for use with the Hyprez Applicator Gun.

Hyprez Diamond Compounds — a true invention, unique in composition . . .

- Are used in 19 foreign countries, in addition to the United States and Canada.
- Are patented in Switzerland, Sweden, Great Britain, and France.
- Are manufactured under exclusive license in Great Britain, Switzerland, and France.

This worldwide acceptance — the result of 15 years of research and rigid quality control — is guarantee that Hyprez will do your finishing job best.

HYPREZ DIVISION
ENGIS EQUIPMENT COMPANY
431 SOUTH DEARBORN ST. • CHICAGO 5, ILL.

LICENSEES
Engis Ltd., 25 Victoria Street, London SW-1, England
Durox S. R., 80 Rue St. Jean, Geneva, Switzerland
Laminor S.A., Annecy, France

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tain a given speed with large load variations, while regulating belt tension and maintaining belt alignment automatically. An additional design feature permits the pulley's face assembly to be replaced without replacing the entire pulley.

Hi-Lo pulleys are made in seven models, the model depending upon the size of the motor involved. At 1750 rpm, maximum horsepower recommended ranges from ½ to 5 hp. Pulleys are also available with dual-ratio and countershaft bases. **T-4-1861**

Ball Bearing Gage

A Swiss machine which automatically gages and classifies rollers and balls for bearings in diameter groups with increments of 0.00002 inch with a maximum possible error of 0.000004 inch has been introduced into the United States by Carl Hirschmann Co., Inc., 30 Park Ave., Manhasset, N Y.

This machine, called the Censor Classifier, is fully automatic. Cylindrical pieces such as rollers, balls and needles are fed at random into a hopper. A simple feeding mechanism eliminates need for attendance. Over and undersize pieces are kicked out separately. All others are within tolerance and are classified in as many as 7 matched groups.

Minimum-maximum dimensions of pieces to be gaged are needles, 5/64 to 1/8 inch diameter by 5/16 to 61/64 inch long; rollers, 1/8 to 19/32 inch diameter by 13/64 to 7/8 inch long; and balls, 5/64 to 25/64 inch in diameter. Output per hour ranges from 4000 to 7000. The machine, which weighs 400 lb, requires a floor space of 22 x 35 x 63 inches. **T-4-1862**

Faster ANGULAR SET-UPS
WITH GAUGE BLOCK ACCURACY
MAGNA-SINE

ON angular set-ups the Magna-Sine saves hours of set-up time, provides positive accuracy, holds work securely without distortion.

The Magna-Sine is a quality permanent-magnet chuck mounted on precision hardened and lapped hinged plates. A Table of Constants provided, quickly shows the standard gauge blocks to insert between the plates for any angle—single or compound. Set-ups to gauge block accuracy take minutes, not hours! When closed, the Magna-Sine is used as a conventional magnetic chuck. Thousands are in daily use.

Write for your free copy of the Magna-Sine Catalog which shows all styles and sizes . . . price list is included.

OMER E. Robbins COMPANY
DEPT. E-1, 24800 PLYMOUTH RD. • DETROIT 39, MICH.
Also producers of special gauges and fixtures

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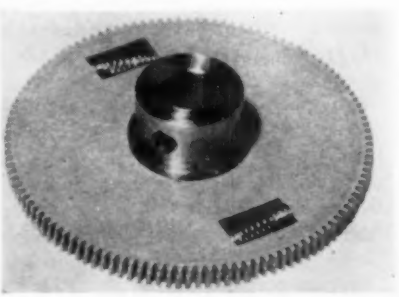
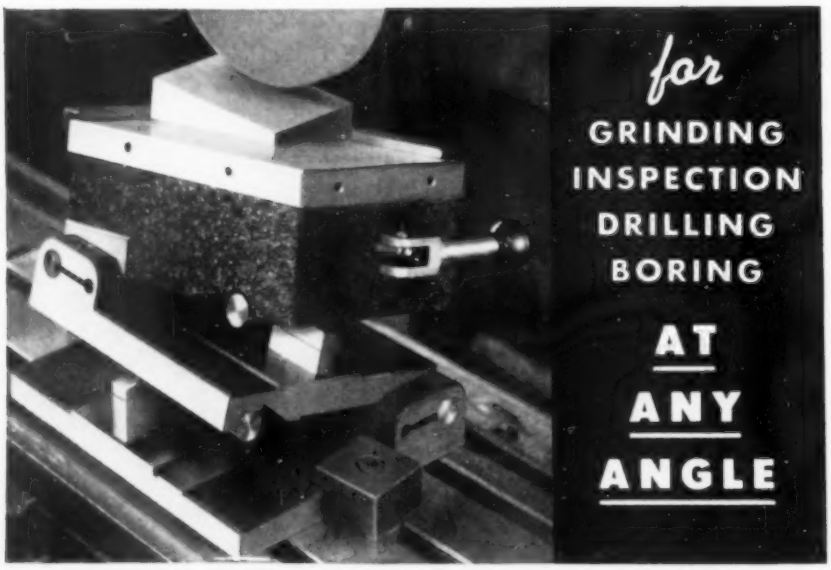
Anti-Backlash Gear Assembly

A precision anti-backlash gear assembly, called the Type No. P2, has been designed by PIC Design Corp., 160 Atlantic Ave., Lynbrook, L.I., N.Y. for use in applications where zero backlash is required. Stainless steel springs take up the backlash. Two





FOR FURTHER INFORMATION, USE READER SERVICE CARD: INDICATE A-4-186

aluminum annodized gears can be rotated in opposite directions until they engage firmly with the mating gear, avoiding backlash regardless of direction of rotation.

Units are designed to use three standard adapters for ⅛, 3/16 and ¼ shafts, and have stainless steel set-screws for holding and sub-drill hole for fixed pinning.

Gears are available from stock in the following pitches: 48, 64, 72 and 96 pitch 20 degree pressure angle, with 14½ degree pressure angle available on request. There is a wide selection as to number of teeth. **T-4-1871**

Carbide-Tipped Mills

Wendt-Sonis Co., Hannibal, Mo., has announced carbide-tipped end mills and shell mills with helical teeth. Primarily, the mills are designed to obtain smoother finishes with less horsepower required because the helical teeth maintain a constant cutting relation with the workpiece. Life of these cutting tools, marketed under the name of Shear-Carb, is considerably increased as tool shock is reduced when helical teeth engage the work.

Sizes offered are from ½ to 2 inches diameter for end mills, and from 1¼ to 6 inches diameter for shell mills. Both are made in styles from carbide grades to machine any material.

T-4-1872

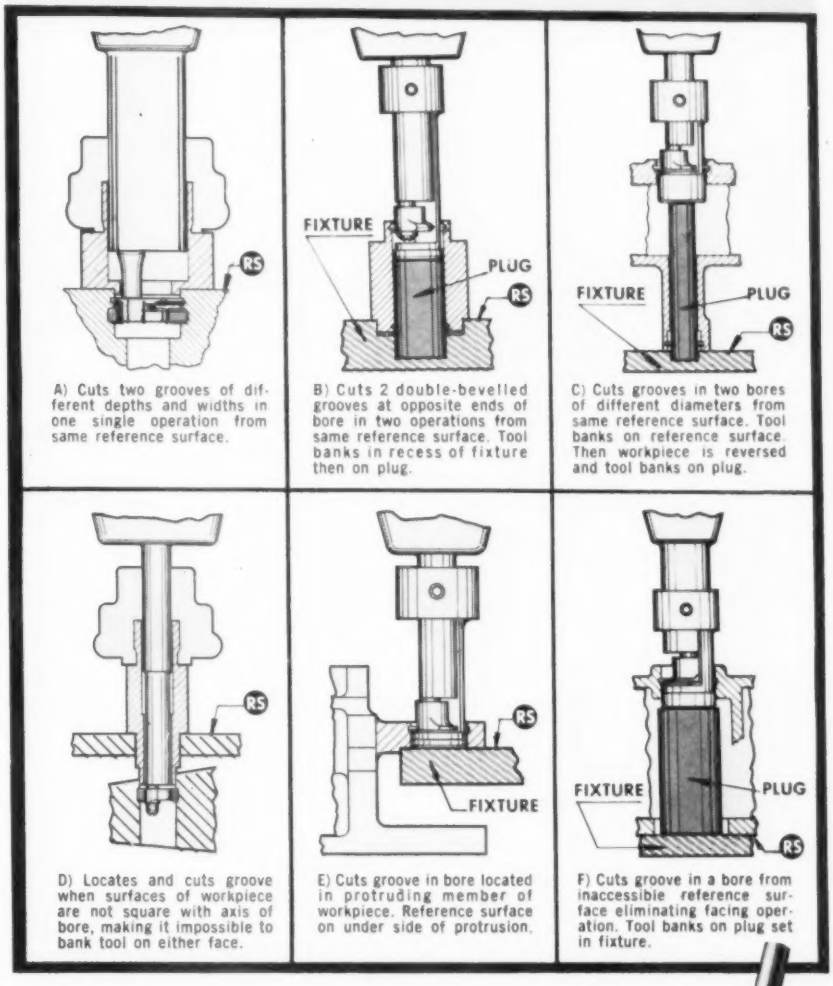
Accumulator

A hydraulic device designed to maintain constant pressure, eliminate shock and surges, and compensate for fluid leakage in hydraulic systems, is announced by Superior Hydraulics Div., 15201 St. Clair Ave., Cleveland 10, Ohio.

This large capacity separator type, cylindrical double-shell accumulator incorporates a floating piston which transmits the pressure of the precharged gas to the working medium and presents entrainment of the gas into the hydraulic fluid.

The outer shell acts both as a gas container, and as a protective cover to

Even Unskilled Labor Can Use This Versatile Tool Accurately! It Simplifies Internal Grooving Problems, Cuts Production Costs!



A) Cuts two grooves of different depths and widths in one single operation from same reference surface.

B) Cuts 2 double-bevelled grooves at opposite ends of bore in two operations from same reference surface. Tool banks in recess of fixture then on plug.

C) Cuts grooves in two bores of different diameters from same reference surface. Tool banks on reference surface. Then workpiece is reversed and tool banks on plug.

D) Locates and cuts groove when surfaces of workpiece are not square with axis of bore, making it impossible to bank tool on either face.

E) Cuts groove in bore located in protruding member of workpiece. Reference surface on under side of protrusion.

F) Cuts groove in a bore from inaccessible reference surface eliminating facing operation. Tool banks on plug set in fixture.

Amazingly versatile! Your toughest recess cutting problems can be met simply and efficiently with the Waldes Truarc Grooving Tool because it offers a whole range of possibilities beyond the range of ordinary recessing tools.

Wide Cutting Range! The Waldes Truarc Grooving Tool comes in 5 models... enabling you to cut accurate grooves in housings with diameters from .250 to 5.00 inches.

Send Your Problems to Waldes! Send us your blueprints... let Waldes Truarc Engineers give you a complete analysis, price quotation and delivery information on the most economical tool set-up for your particular job. There is no obligation!

Write NOW for a 20-page manual containing full information on Waldes Truarc Grooving Tool

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TRUARC®
GROOVING TOOL

Made by the Manufacturers of Waldes Truarc Retaining Rings
WALDES KOHINOOR, INC., 47-16 Austel Place, L. I. C. 1, N. Y.
Waldes Truarc Grooving Tool Manufactured Under U. S. Pat. 2,411,426

TE047
Waldes Kohinoor, Inc., 47-16 Austel Pl., L.I.C. 1, N. Y.
Please send me your new 20-page technical manual on the Waldes Truarc Grooving Tool. (GT-2-53)
Name_____
Title_____
Company_____
Address_____
City_____ Zone_____ State_____

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prevent damage or interference with the free movement of the piston.

With this accumulator there is no need of a compressor, and machine down time which results from a malfunctioning component is avoided. In addition, designers can simplify designs and lower installation costs.

These accumulators are designed for 2000 psi and will deliver 2310 cubic inches of oil with a pressure drop of 10 percent and hold a net gas capacity of 21.950 inches.

Other models of this design are now being produced in capacities from 2 to 21,950 cubic inches, for normal commercial requirements. Also, for 5,000-lb service with burst pressure of 20,000 lb, other units are available. **T-4-1881**

Cutter Grinder

A very compact complete machine for precision sharpening of single-flute milling or engraving cutters is announced by the Production Tool Div. of Johnson & Bassett, Inc., Worcester, Mass.

This Model MT1100 cutter grinder requires working space only 14½ inches high, in an area 15 inches square. It has a built-in diamond wheel dresser mounted on the wheel guard which allows the wheel to be dressed without disturbing the tool head. Four precision ball bearings prevent end play in the sealed spindle, and sliding sleeve is completely dustproof.

The rocking head is accurately controlled by a convenient thumb screw

in the base. Index plunger and dial in tool head accommodate indexing 1, 2, 3 or 4 sides or flats. The standard spring collet receives cutter shanks up to ½ inch diameter. A special tool head is also available for sharpening ball-nose as well as regular single flute cutters. **T-4-1882**

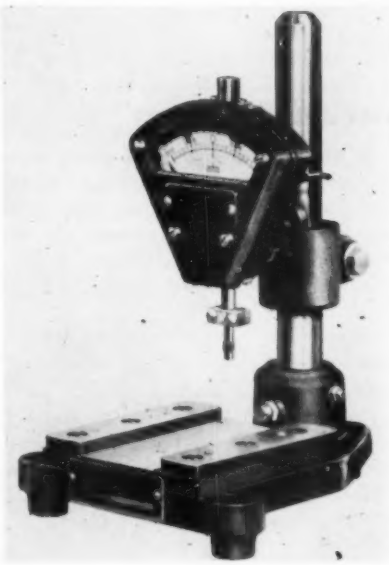
Indicator Gage

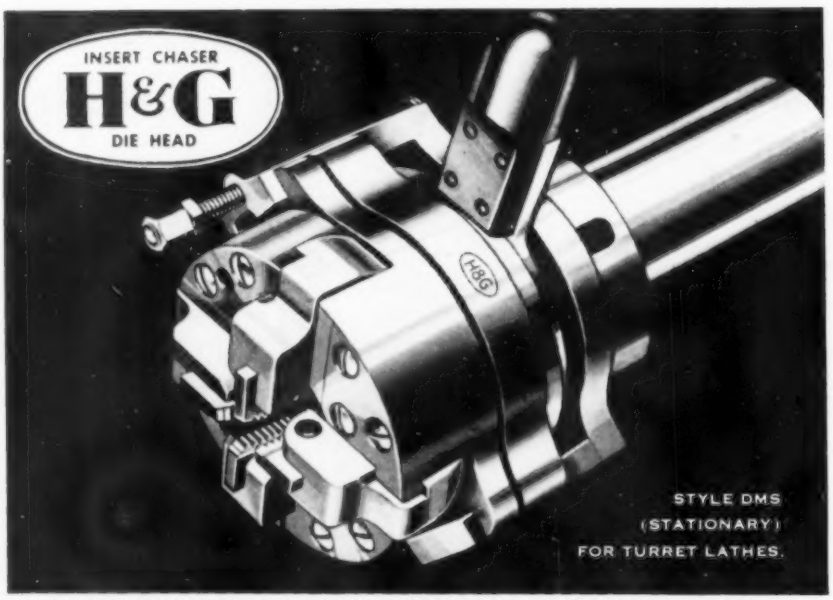
O-Vee Gauge Co., 2516 W. Vernon Ave., Los Angeles 8, Calif., has offered the Smith T & C indicator gage for use under workshop conditions. It is equipped with tolerance pointers and lifting lever which raises the spindle approximately ½ inch.

Special removable rails incorporated on the base enable the user to design low cost gaging fixtures for checking internal and external dimensions.

The indicator head can be supplied without the base so the user can build it into his own gaging fixtures or the separate head may be preferable for positioning machine tool slides.

T-4-1883





STYLE AND SIZES FOR ALL MACHINES ON WHICH THREADS ARE CUT

This die head is unique

THERE IS NO OTHER LIKE IT

It cuts threads with insert chasers. These are, in reality, small sections of the business end of large and expensive chasers, but with this important difference: *their cost is so low they can be even thrown away when dull.* For example, for less than $40 you can get a dozen sets of insert chasers, each set ground ready to go. Change now to insert chaser die heads and watch your performance improve. "SELECTING THE PROPER DIE HEAD FOR THE JOB" sent free on request.

THE EASTERN MACHINE SCREW CORPORATION 27-47 Barclay St., New Haven, Conn.

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Magnetic D-C Regulator

Low ripple and precise regulation characterize the EM-28-1B tubeless magnetic-amplifier regulated d-c power supply announced by Engineered Magnetics, 11812 Teale St., Culver City, Calif. Although developed for airborne applications, this power supply is readily adapted to bench use. The unusually small size, 12 by 7 by 9 inches, was designed to fit the supply into the same space occupied by the battery it replaces. Performance tests indicate that it will give long, maintenance-free life while delivering continuously 0 to 1.5 amperes. Voltage is easily adjusted within the range of 28 to 32 volts, d-c, while the single-phase input fluctuates between 105 to 125 volts and 380 to 420 cps, a-c. Regulation is held to better than 0.2 percent with 5-millivolt-rms ripple throughout a temperature range of −30F to +120F at altitudes up to 70,000 feet. Recovery time is better than 0.2 second.

T-4-1891

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Comparator

An amplifying comparator that employs a cable release to lift the contact point by remote control, protect the instrument from the heat of the operator's hand, unequal pressure and vibration, is announced by the George Scherr Co., 200 Lafayette St., New York 12, N. Y.

Called the Millimess indicator, it is an extra sensitive comparator with a wide range of 0.004 inch and is graduated in 0.0000050 inch. Clear, sharp graduation lines are each 0.080 inch apart for fine fraction estimation.

An important improvement is the adjustment of the dial hand, which can be set to zero by means of a knurled thumb screw at the bottom of the housing.

This comparator can be built into any existing fixture, holder or stand or may readily be adapted for special gages and measuring devices. **T-4-1892**

Wrench for Socket Screws

A new wrench for socket screws has been patented by the LC Wrench Co., 1149 Milwaukee Ave., Chicago, Ill. The line consists of 16 wrench sizes which are actuated by any manual or power standard square drivers. With the knurled base even good hand turning is possible.

Available in sizes from $\frac{1}{4}$, $\frac{3}{8}$ and $\frac{1}{2}$-in. sizes, the wrench offers flexibility, speed and strength. **T-4-1893**

A Jig Borer And Miller For Jobs Up To 30"x48"!

- Fulfills every requirement for accurate boring, drilling and vertical milling of large workpieces up to 5000 Lbs.
- Simplified setup, operation and inspection are possible because many parts are easier clamped on a table than mounted on a horizontal machine.
- All controls are in a single movable panel. Operator can control table and spindle from most convenient location without ever changing his position.
- Infinitely variable spindle speeds and feeds. Non-gear, easily maintained direct drives provide unusual smoothness of operation.
- 35" throat capacity—safety controls for machine, job and operator—unusually heavy construction—and a dozen other exclusive features.

Ask For Brochure

KNIGHT VERSATILE ACCURATE RIGID

W. B. KNIGHT MACHINERY CO. • 3920 WEST PINE BLVD. • ST. LOUIS 8, MO.

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Trade Literature

For Free Booklets and Catalogs— Convenient Request Card on Page 201

Drilling

Twenty-four page catalog describes feed units, tapping units, hydraulic drill presses, index tables, fixed and adjustable center drill heads; includes pertinent information on multiple drilling applications plus technical data on feeds, speeds and horse power, recommended coolants for materials, etc. Michigan Drill Head Co., P. O. Box 4643, Detroit 34, Mich. **L-4-1**

Welding

Enlarged 40-page edition "Tooling for Welding" describes and illustrates standard and special tooling, fixtures and machinery for high quality, high speed, low cost welding; includes examples of special purpose automatic welding machinery using submerged arc and inert arc processes. Cecil C. Peck Co., 14901 Woodworth Rd., Cleveland 10, Ohio. **L-4-2**

Specify POPE
HEAVY DUTY
WHEEL HEADS
"A"
Note the big precision bearings and the big shaft.
A pair of precision thrust bearings stabilize the shaft against any axial movement in either direction. (No end play)
The double row cylindrical roller bearings carry the radial loads with ease and at low temperature.
"B"
Power-Max 25 HP—available with standard No. 30, 40, 50 or 60 milling machine noses.
Send us your specifications and ask for Catalog No. 59
Taper mounting provides for precise individual preloading of the radial bearings.

POPE Heavy Duty Wheel-Head Spindles are designed for a wide variety of applications such as grinding, boring, milling, drilling and many other operations requiring PRECISION COMBINED WITH RUGGEDNESS in the spindles.

For continuous production and trouble-free operation THERE'S NOTHING LIKE A POPE SPINDLE WITH ROLLER BEARINGS.

No. 94

Specify POPE PRECISION SPINDLES

POPE MACHINERY CORPORATION
Established 1920
361 RIVER STREET - HAVERHILL, MASSACHUSETTS

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-190

Vise

Data sheet (#658B) gives application and construction details of Mil-Omatic M-M automatic vise and machining fixture for production work; includes dimensions necessary to planning installation of the vise. Wilton Tool Mfg. Co., Inc., 941 Wrightwood Ave., Chicago 14, Ill. **L-4-3**

Die Parts

Twenty-eight page catalog covers half-million stock parts for dies; includes dimensions and specifications as well as illustrative drawing for each type part; covers die bushings, die punches, slug ejector punches, quills, stripper guide bushings. Toolcraft Industries Corp., 305 E. 140th St., New York 54, N. Y. **L-4-4**

Titanium Tube

Two grades of titanium tubing and pipe described in 4-page bulletin; outlines advantages and applications, gives physical properties plus data on corrosion resistance, machining characteristics, heat treating, etc. Test pictures show conditions it will withstand in use. Alloy Tube Div., The Carpenter Steel Co., Union, N. J. **L-4-5**

Gaging

Manual presents complete information on company's limit-type gages including illustrations, descriptions, specifications and dimensions, discussion of design features, and uses. One section, devoted to technical engineering data, presents points on gaging policy, tolerances, applications, maintenance, terminology. Tab indexed for quick reference. Request directly from The Sheffield Corp., Box 893, Dayton 1, Ohio.

Grinding

Pocket-size pamphlet, "Safety Guide for Grinding Wheel Users" outlines 20 simple safety precautions which grinding wheel users should check when operating equipment. Grinding Wheel Institute, 2130 Keith Bldg., Cleveland 15, Ohio. **L-4-6**

Materials Handling

Four-page booklet presents details on company's Rental-Lease-Own plan for materials handling equipment. Market Forge Co., Everett, Mass. **L-4-7**

Grinder

Illustrated brochure discusses in detail the Landis 10-in. and 14-in. plain hydraulic cylindrical grinding machines; includes specifications, extra equipment available, and typical grinding operations; points out construction, special features and advantages. Landis Tool Co., Waynesboro, Pa. **L-4-8**

Conveyors

Extensively illustrated 8-page folder #954, "10 Things Hired Hands Can't Do" become 10 ways that Junior the Light weight trolley conveyor can cut production costs," points out many advantageous uses of these conveyors in various plants. Jervis B. Webb Co., 8951 Alpine Ave., Detroit 4, Mich. **L-4-9**

Draw Press

Twelve-page brochure explains purpose and method of operation of recently developed Cleromatic press; elaborately illustrated with drawings and graphs. Adv. Dept., Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill. **L-4-10**

Retaining Rings

Eight-page supplement No. 1 to Truarc retaining ring Catalog No. RR 9-52 contains revisions, corrections, additions and new product developments. Truarc Catalog Service, Waldes Kohinoor, Inc., 47-16 Austel Place, Long Island City, N. Y. **L-4-11**

Contour Machining

Extensively illustrated 20-page brochure presents Contour-matic semiautomatic machines that saw, file, polish and grind; explains main features, applications and advantages; also covers accessories available for this equipment. The DoAll Co., Des Plaines, Ill. **L-4-12**

Lubrication

Illustrated 8-page bulletin offers details on company's Multival System of centralized lubrication for small machines or equipment, pointing out construction, operation, special features and advantages. The Farval Corp., 3249 E. Eightieth St., Cleveland 4, Ohio. **L-4-13**

Taps and Dies

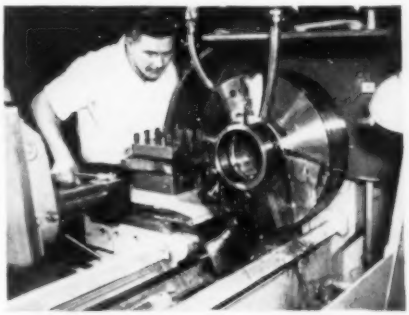
Catalog No. 22 gives dimensions, specifications and prices, and illustrates each type tap and die in company's line; also includes engineering information on standards, nomenclature, conversion tables, table of tap and tap drill recommendations based on various threads. Winter Brothers Co., Rochester, Mich. **L-4-14**

W+B INDUSTRIAL LUBRICANTS

For 67 Years
LUBRICATION ONLY

Out of the W & B labs have streamed a long succession of lubrication specialties: transparent grinding coolants . . . paste-form and fluid-type water solubles . . . concentrated bases to blend and fortify metalworking lubricants . . . oils for critical grinding, honing . . . and dozens of others. You see, for over half a century W & B has stuck to its own particular last — designing lubricants that keep production up, machining costs down. Successfully, too. Ask any top machine operator.

Take W & B Grinding Concentrate 1500. This transparent water-soluble lubricant for grinding ferrous metals and titanium is used as thin as 200 to 1. Yet it keeps grinding wheels unusually open, settles chips almost instantly, stays virtually foam-free.



Do *you* have a lubrication headache? Ask us, without obligation, to send a W & B Lubrication Expert into your plant to consult with you.

THE WHITE & BAGLEY CO.

Established 1888

Worcester Detroit

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Large Capacity Feeding of Small Parts with SYNTRON PARTS FEEDERS

- Fully Automatic
- Parts Fed Single File in Oriented Position
- Rheostat Controlled

Provide accurate high speed handling of small parts to automatic machines and continuous processing equipment. Electromagnetic operation — Compact, easy to install, low cost.

Close up views show how parts emerge from feeder trough.

Send for complete catalogue and performance data—FREE

SYNTRON COMPANY

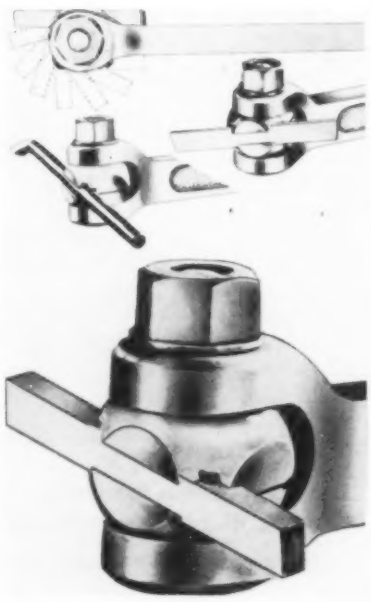
340 Lexington Ave. Homer City, Pa.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-192-1

NEW sensational TOOL HOLDER

one holder replaces many old types

swings up & down and all around



The tool bit is firmly held by an ingenious method in a split swivel ball in any desired position. Crystal Universal Toolholder is the only versatile, multi-angle position holder enabling the machinist to swing the tool bit to any required angle.

Crystal Universal Toolholder is drop forged from a special steel, accurately machined, heat treated and hardened.

Crystal Universal Toolholder can now be supplied in two sizes,—one being suitable for $\frac{3}{8}$" square, $\frac{3}{8}$" Round Toolbits, $\frac{3}{8}$" dia. Boring Bar and 0.475 x $\frac{1}{8}$" x $\frac{1}{2}$" x $4\frac{1}{2}$" Special Parting Off Blade—the other to suit $\frac{1}{4}$" square, $\frac{1}{4}$" round Toolbits; $\frac{1}{4}$" Boring Bar and $\frac{1}{16}$" Parting Off Blade.

SEABOARD STEEL COMPANY of AMERICA, Inc.

1775 BROADWAY, NEW YORK 19, N. Y.

Write for descriptive folder and price.

Producers of "Progen" self-Tempering Steel—Seaboard Special Alloy "Red Label"—"Secobalt" High Speed Tool Steel, Etc.

Few choice protected territories open for ambitious, hard-hitting salesmen who have cars and can travel—selling toolholders and all products of Seaboard Steel Company of America, Inc.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-192-2

Measuring Tools

Complete line of precision tools, dial indicators, saws and ground flat stock presented in 464-page catalog No. 27, published to commemorate company's 75th anniversary; illustrated to show tools in detail; sectionalized, indexed and cross referenced for easy selection. Description of each tool includes outstanding features, instructions for use, and typical applications. Request directly from The L. S. Starrett Co., Athol, Mass.

Tube Straightening

Bulletin No. 55, "How To Straighten Pipe and Tube," offers comprehensive discussion of subject of straightening ferrous and nonferrous material; analyzes basic methods of two plane vs rotary machines; covers most efficient operation of equipment; supplementary uses for equipment; 11 case studies showing machinery in use in various areas. Mackintosh-Hemphill Co., Ninth and Bingham Sts., Pittsburgh 3, Pa.

L-4-15

Metal Processing

Complete line of laboratory and production rolling mills, slitters, levelers and accessory equipment shown in 4-page folder No. 210. Stanat Mfg. Co., 47-28 37th St., Long Island City 1, N. Y.

L-4-16

Milling Cutters

Catalog No. 31 gives comprehensive descriptions of company's types A, H, J, L and C face milling cutters with charts supplementary showing specifications, application and catalog number of each type; well illustrated with photos, drawings and sketches. Lovejoy Tool Co., Inc., Springfield, Vt.

L-4-17

Pressure-Sensitive Tapes

Multiple and varied uses of pressure-sensitive tapes in metalworking industry described and illustrated in 56-page manual; for convenience, divided into sections on machining and finishing, electroplating, stamping and fabricating, welding, product assembly, plant maintenance and various other work; data section covers properties for each of 47 tapes. Minnesota Mining and Mfg. Co., Dept. P-537, St. Paul, Minn.

L-4-18

Universal Joints

Revised 12-page illustrated catalog covers applications, engineering data, models and sizes, proper joint selection and other points regarding line of Rzeppa constant velocity universal joints. Joint Div., Gear Grinding Machine Co., 3901 Christopher, Detroit 11, Mich.

L-4-19

Technical Shorts...

Laboratory Produces Diamond

NATURE'S HARDEST substance, diamond, has now been successfully duplicated by man in a process developed by scientists of the General Electric Research Laboratory. Although there may be the possibility of someday producing stones of some size and quality, at present, importance of the development lies in possibility of eventually being able to produce stones for industrial purposes. This application, however, will be feasible only if the present high cost of making them can be reduced. Of particular importance now is that to date, more than 100 stones have been produced, largest of which measures 1/16 of an inch in its longest dimension.

Scientists responsible for the project were Drs. Francis P. Bundy, H. Tracy Hall, Herbert M. Strong and Robert Wentorf. In the process used to produce the largest single crystal, a carbonaceous compound was subjected for many hours to a measured pressure approximately 800,000 psi exerted in the Laboratory's new 1000-ton press.

Considered of fundamental importance was development of a chamber enabling the scientists to maintain for the first time temperatures above 5000 F at pressures in excess of 1,500,000 psi. This method resulted in smaller diamonds, but they often were produced in solid clusters.

* * *

Film Stresses Precision in Manufacturing

EXAMINATION of the care and know-how that goes into its manufacturing operations is presented in the color sound film "Accent on Accuracy" recently released by Pratt & Whitney Div., Niles-Bement-Pond Co. The film follows step by step the various operations, inspections and tests required to turn out P & W jig borers, emphasizing attention given to all details. Running time for the 16 mm movie is 28 minutes.

The film is available on a free-loan basis to technical society meetings, to plant groups of management and supervisory personnel, or to plants which may use it for in-shop instruction. Reservation requests should be made by society program chairmen or company officials.

Recordings on Metal Joining

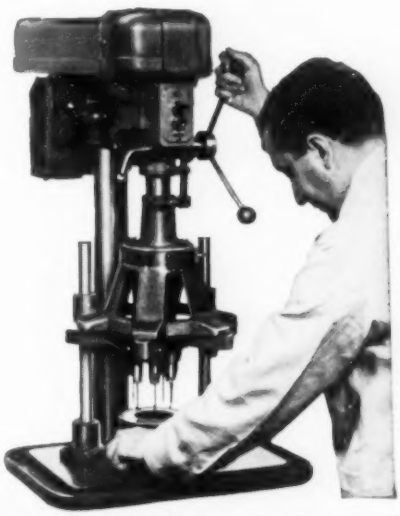
INFORMATION on procedures, applications and techniques involved in the low heat input metal-joining process has been presented in a package by putting it on 33-rpm records. The two-hour album reproduces a week-long course on the subject for weldors, maintenance men and mechanics interested in details of process, as well as the occasional weldor who is interested in simplified techniques.

The "Eutectic Welding Institute on Records" album is the first release of data on the low heat input process in this concentrated self-study form. In addition to explaining the procedure, use of equipment, selection of welding material, etc., the recordings describe numerous industrial applications and possibilities for welding.

With the records is a 60-page manual containing "blackboard" diagrams, a series of tests with answers and a reference copy of the record script.

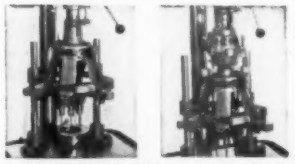
Material used for the records is the same as that presented to the company's district engineers during training. The records, which have been made by Eutectic Welding Alloys Corp., are offered to business on a free-loan basis, through its district engineers.

Taps or drills over a million different hole combinations



The NEW

ETTCO-EMRICK Flex-Shaft Adjustable Spindle Multiple Head



IT DRILLS — IT TAPS. Takes only a moment to convert. 1:1 drive ratio ideal for lead screw tapping.

FLEXIBLE SHAFT SPINDLES are positioned quickly, accurately even while unit is running.

FLEXIBLE SHAFTS run in either direction without unravelling, whip or vibration — can be removed in seconds.

- Exclusive flexible shaft drive spindle design makes it the most versatile, most easily adjusted head ever. It's just what the doctor ordered for **stepping up production and slashing costs** on an unlimited variety of small parts tapping and drilling. It's virtually a complete production line — all in one compact, lightweight, low-cost unit.
- Ingenious flex-shaft spindle design with quick adjustment feature on each spindle gives wider range of settings — cuts set-up time way down.
- The only head of its kind that taps or drills on any drill press without use of reversing motor.
- For horizontal or vertical tapping or drilling.
- Needs no special engineering — you put it to work on your jobs at once.
- Capacities up to 5/16".
- Unconditionally guaranteed to do the job for which it's sold — you can't lose!

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For details in print write for Bulletin 600

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Men at Work . . .

Eugene Easterly has been made vice-president of distribution, and **E. G. Hickling**, vice-president of operations, for Linde Air Products Co., Div. of Union Carbide and Carbon Corp. Mr. Easterly, who has been with Linde since 1931, was formerly distribution manager. Mr. Hickling, who joined the company in 1927, became works manager in 1949.

During its recent annual meeting, members of The Aluminum Association elected **Everett G. Fahlman** of The Permold Co. as president for the coming year. Vice-presidents elected at the same time were **L. M. Brile**, Fairmont Aluminum Co.; **Frank B. Cuff**, Aluminum Co. of America; and **George N. Wright**, Harsch Bronze & Aluminum Foundry.

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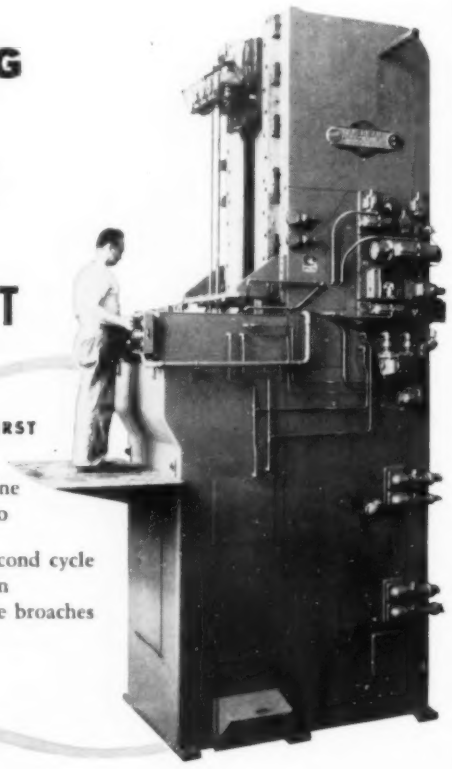

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Three staff appointments for both The Peninsular Grinding Wheel Div. of Abrasive and Metal Products Co. and Sterling Grinding Wheel Co. have been announced. **S. S. Kistler** will be director of research for both organizations in charge of development of studies and solution of problems pertaining to research and development. Dr. Kistler has been dean of engineering at the University of Utah. **W. R. Morgan** is now director of manufacturing for both Peninsular and Sterling. Dr. Morgan adds this responsibility to his post of manager of vitrified for Peninsular. **William H. Fellows** is new director of sales for both Sterling and Peninsular.

Two new vice-presidents at Heppenstall Co. are **Irvin E. Walton**, purchasing agent, who was made vice-president in charge of purchases and traffic, and **Howard G. Grim**, general manager of operations, who was elected vice-president in charge of manufacturing.

Election of **James T. Eaton** to fill the recently created post of vice-president-production has been announced by E. F. Houghton & Co. Dr. Eaton, who has been with Houghton since 1937, formerly was director of research for the company.

Appointment of **Joseph V. Delaney** as general manager of the Columbia Div. of The Lodge & Shipley Co. has been announced. He has been associated with the division since 1942, and is also a director of the parent firm.

Announcement of the appointment of H. W. North as chief engineer of the newly established Process Equipment Dept. of its Engineering Works Div. has been announced by Dravo Corp.

Promotion of **Kurt O. Tech** to vice-president in charge of engineering and of **A. J. McLaren** to vice-president in charge of sales has been announced by The Cross Co. Mr. McLaren, who has been with Cross for eight years, has served as sales manager since 1953. Mr. Tech, chief engineer at Cross for nine years, recently was added to the company's board, at the same time **Herbert M. Shilson** was made a director to replace the late Milton O. Cross Sr.

Douglas C. Lynch is now president of Brush Electronics Co. He joined the company in 1932 and has been serving in the capacity of executive vice-president.

Paul A. Grobey is new director of engineering and research for Bryant Chucking Grinder Co. He previously was the company's director of research.

N. Douglas MacLeod, Jr. has been made executive vice-president of Abrasive Machine Tool Co. In his new capacity, he will supervise all the company operations.

Robert M. Zimmerman has been appointed general manager, operations, of Atkins Saw Div. of Borg-Warner Corp. He formerly was with Delog Hook and Eye Co.

Firth-Loach Metals Inc. has announced appointment of **Robert C. Lindberg** as superintendent of production, and **William C. Seitz** as manager of research and development. Mr. Lindberg will be responsible for carbide quality and production and maintenance of raw materials and powder stocks. Both men have extensive experience in the carbide field and are veterans of several years with Firth Sterling.

Richard A. Biggs has been made manager of product development for Stainless Div. of Crucible Steel Co. of America. Before this appointment, Mr. Biggs was sales manager and a director of the Franki Foundation Co.

Arthur J. Redmond has been made a vice-president of Allied Products Corp. Mr. Redmond, who has been with Allied for 20 years, assumes responsibility for all sales activities of Richards Brothers Div.'s hard die services, Allite, and plastic dies as well as resulting products.

New research director of Furane Plastics, Inc. is **Ben Carroll** who formerly was materials engineer with the Organic Materials Div. of the Sandia Corp.

A new board of directors has been elected for Alloy Precision Castings Co. at the recent special meeting of the company's stockholders. Chairman of the board is **Adm. Alan G. Kirk,** who also is chairman of the board and president of Mercast. Board members elected were **Ronald D. Gumbert, Waldo Hatch, E. D. Hopper** and **Peter D. Kleist.**

James Adams, Jr. has been appointed to the position of chief engineer, research and product design, for Manhattan Rubber Div. of Raybestos-Manhattan, Inc. Mr. Adams has been associated with the company since 1939.

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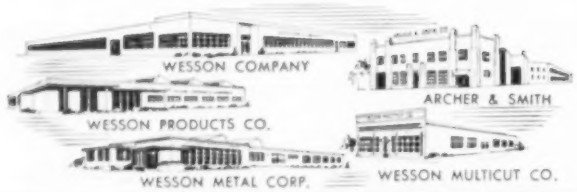


carbide NEWS

Special Wesson Multicut holder for diamond-shaped 55° throwaway inserts. The top of the locator and back-up plate can be seen below the end cutting edge. Chip breaker-clamp on top of the tip is adjustable. The holder and diamond-shaped inserts are specials. They broaden the standard "no grind" line of Multicuts, tips for which are shown below.

First Holder For 55° Throwaways Announced

Permits undercutting, contouring, turning, etc. in confined places

Wesson engineers have developed the first successful throwaway insert holder for use of 55° diamond-shaped inserts. The announcement was made following successful completion of tests.

The major problem preventing development of such a holder in the past has been the difficulty of locating and holding the thin insert securely while cutting. This has been overcome in the special Wesson holder by use of anvil-locator plates to both support and back up the tip.

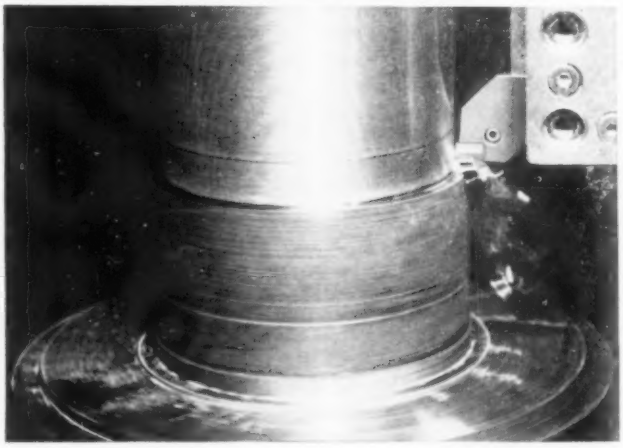
Big advantage of this new holder development is the ability of the holder to perform undercutting, contouring, turning and facing operations in confined places—thus extending the economies of "no grind" inserts to these tracer-lathe operations.

The holders and inserts are listed as specials and are in addition to the line of standard holders for round, triangular, and square inserts announced by Wesson last month.

Field tests on the new holder, listed as model MX-26-T6, include machining of the thread diameter on an SAE 8620 automotive stem pinion. Feed was .012-.014 in.; depth of cut 3/16 in. Average production per cutting edge was 623 pieces, or a total of approximately 2500 pieces per throw-away insert. Wessonmetal Grade WM was used for the insert.

Offset Multicut Holder Added to Standard Line

Particularly useful for combined turning and facing, Wesson Multicut band-type holders are now available in right and left hand offset styles (Models GAR and GAL). By angling the holder in the tool block 5°, the tool can be used for square shoulder turning and facing without resetting. It uses the standard Wessonmetal style D-80 solid diamond-shaped insert with 80° included angle. Ask for Bulletin GAR-GAL.



Metal-removal rate was boosted 33% and tool life per grind was more than doubled in the turning of the machine tool spindles by a large Eastern machine tool builder with this new standard Wesson Multicut offset band-type holder. Machine speed was unchanged. The spindle is SAE 1045 and 200 Brinell.

tools Wesson carbide Wessonmetal

Bulletin #552-M is now available from Wesson. It gives specifications, prices, etc., of the standard Wesson Multicut holders for throwaway "no-grind" inserts. Write to:

WESSON COMPANY, Dept. AD
1220 Woodward Heights Blvd.
Detroit 20, Michigan

Field Notes...

Plans **for** the building of the first nuclear reactor to be owned and operated by private industry for research in industrial and humanitarian fields have been completed by American Machine & Foundry Co. Several industrial concerns have been invited to participate in the program on a cooperative basis. Each will be represented on a board of directors which will establish policy for the operation of the reactor facility. The reactor and its supporting laboratory facilities, which will be built in the New York area, will cost between $1,000,000 and $1,500,000 and can be available for use in 18 months, announcement stated.

V V V

National Inventors Council of the U. S. Department of Commerce, with the aid of the three military services, has published a list of 109 technical problems confronting the armed services which will interest scientists, research groups and inventors who might offer technical aid to the defense effort. Typical of the problems listed in the publication is a method of spot or seam welding stainless steel. Copies of the listing are available from the Council, Office of Technical Services, Washington 25, D. C.

V V V

Manufacturers of cemented carbides containing tungsten met recently to form the Cemented Carbide Producers Association. Membership in the organization, which was formed for the purpose of furthering use of the products of the industry, is comprised of the majority of the producers of cemented carbides in the United States. Inquiries pertaining to the association should be directed to Hunter-Thomas Associates, 2130 Keith Bldg., Cleveland 15, Ohio, who were engaged to manage the affairs of the group.

Ex-Cell-O Corp. has acquired Michigan Tool Co. which operates three plants in Michigan, and a subsidiary, Colonial Tool Co. in Windsor, Canada. Michigan Tool plants are located in Detroit, Manistee and Traverse City. The company will continue to operate as a separate unit under its present management.

V V V

All assets of Eagle Supply Co. of Paterson, N. J., have been purchased by Precision Supply & Machine Co. The acquisition more than doubles Precision Supply's stock permitting its service to both its own customers and those of Eagle Supply to be considerably broadened.

At the same time, the company announced its appointment as jobbers for The Carborundum Co.

V V V

Jones & Laughlin Steel Corp. has acquired the firm of W. J. Holliday & Co., Inc., operator of steel warehouses in Indianapolis and Hammond, Ind., which now is the W. J. Holliday & Co., Div. of J&L. At the same time, Holliday's affiliate firm, Monarch Steel Co. became J&L's Monarch Steel Div.

purchases

American Chain & Cable Co., Inc. has announced purchase of The Allison Co. of Bridgeport, Conn. According to the announcement, research departments of The Allison Co. and the American Chain and Cable's Campbell Machine Div. have worked closely and together have developed many improved abrasive cutting techniques. Combining the two companies it was felt will permit rapid and orderly development of both machines and wheels. The Allison Co. will continue to operate at its plant in Bridgeport and members of its management will continue in their present positions.

V V V

Aeroquip Corp. through a newly-formed Canadian subsidiary, Prenco-Aeroquip Ltd., has acquired all assets of Prenco Progress & Engineering Corp. of Toronto. The acquired firm is a former licensee of Aeroquip.

V V V

Assets of Staples Tool Co. have been purchased by National Twist Drill and Tool Co. The new owners plan to round out the Staples line of carbide tipped reamers, counterbores and end mills with carbide tipped twist drills, milling cutters and like tools. According to the announcement, no significant changes in Staples management or location is expected, and the acquired company will continue to make and sell an expanded line of tools under its own name.

V V V

Bryant Chucking Grinder Co. has announced purchase of the High Production Machine Co. of Philadelphia by the E. G. Staude Mfg. Co., a wholly-owned subsidiary of Bryant. With this transaction, all manufacturing and engineering for both companies will be conducted at the Staude plant in St. Paul, Minn. All inventory, complete engineering facilities and experienced personnel will be transferred to the Staude plant.

V V V

Inventory, equipment, patents and all other assets of Rapid Titan Mfg. Co. have been purchased by Wilton Tool Mfg. Co. In announcing the acquisition, the company spokesman pointed out that Wilton consequently gains control of a patent which incorporates a basic improvement in rapid acting nuts.

new activities

Custom casting of multicomponent resin mixes to produce end products at its plant has been announced as a new service by Applied Engineering Associates. The company indicates that through this innovation, materials engineers will provide the means for the product designer and sales department of an organization to determine utility and customer acceptance of a contemplated product without that company itself going into the expense of full production. According to the announcement, Applied Engineering will produce finished parts to detailed specifications by modified injection molding technique. The service also offers customers the advantage of being able to project cost analyses accurately.

V V V

Production of titanium sponge is under way in the new facilities of Cramet, Inc., subsidiary of Crane Co. This plant, together with the control plant at Chattanooga finished last year, are in effect scaled down production facilities while in part they are full scale units and function to test and prove process design while in addition they are being used to help train personnel for future production. With the completion of these facilities, the com-

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TOOL BITS

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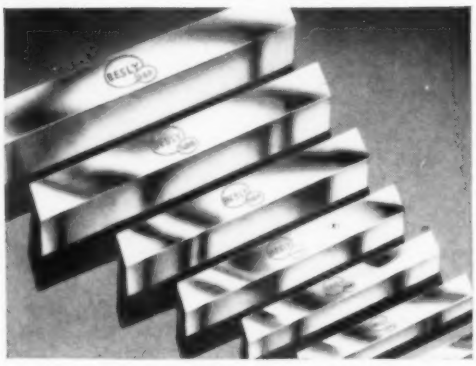

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pany has completed 50 percent of its intended construction.

In operation, the plant takes in titanium bearing ore and converts it by chemical processes to titanium sponge. The output will be consolidated into alloy ingots as well as pure ingots, which will be the starting product for conversion into sheets, strips, bars, shapes and forgings. The remainder will be sold as pure titanium sponge metal.

The company now controls thousands of acres of mineral deposits containing titanium minerals. Besides ilmenite and rutile, the mining operation is recovering other valuable minerals including zircon and rare earths.

V V V

A new assembly plant has been opened in Independence, Iowa, by Micro Switch, division of Minneapolis-Honeywell Regulator Co. Initial production is expected to provide employment for 50 to 100 employees. New products will probably be added during 1955 as tooling becomes available, the announcement indicated.

new companies

A corporation to manufacture a newly developed line of dial indicators and other measuring devices, has been formed in Pleasant Valley, N. Y. The firm, Petz-Emery Inc. is headed by John L. Petz as president who has more than 45 years experience in the field of instrumentation, tool engineering and manufacturing, the past seven of which have been as a partner in the J. L. Petz Co. Vice-president of the firm, Alfred H. Emery, has spent more than 30 years in this field and has contributed several inventions to it. Joseph L. Petz, who is secretary-treasurer of the new company, has spent over 40 years in tool engineering and manufacturing and for the past five years has been a partner in the J. L. Petz Co. The Messrs. Petz are both members of ASTE's Mid-Hudson chapter, and Mr. Emery is a member of ASTE's Northern Massachusetts chapter.

V V V

Formation of Press Automation Systems, Inc., has been announced by the new company's president, Maurice M. Clemons. The firm will specialize in engineering of special automation equipment, and will serve as national sales agent for Hamilton Automation Co. whose president, Jack Young, is also vice president and director of Press Automation Systems. General offices of the new concern is 18212 James Couzens Hwy., Detroit, Mich.

Mr. Clemons, who is a member of ASTE's Detroit chapter, was formerly chief engineer of Sahlin Engineering Co., Inc.

V V V

Engineering, development and manufacturing in the metal and plastics industries will be provided by the newly formed company, Linsley, Inc. in Westport, Conn. Heading the new organization is Donald F. Linsley as president. Mr. Linsley is a member of ASTE's Fairfield County chapter.

name changes

Effective March 1, the name of Honan-Crane Corp., became Houdaille-Hershey of Indiana, Inc., according to an announcement from the parent company, Houdaille-Hersey Corp. in Detroit. According to the announcement, formation of this corporation marks the first step in Houdaille-Hershey's plan to establish a filtration division in its Lebanon, Ind., subsidiary and will strengthen research, engineering and production facilities.

V V V

Announcement has been made by The Barry Corp. of a change in its corporate name to Barry Controls, Inc. The new name is considered to be a more accurately descriptive title in keeping with the organizations present operations.

expansions

Plans for construction of a $2,500,000 plant in Mattoon, Ill., for manufacture of flexible metal hose and tubing, have been announced by The American Brass Co. According to the statement made by Arthur H. Quigley, board chairman of American Brass, the new unit will constitute an expansion of facilities for production of flexible metal hose, and will not affect future operation of the company's American Metal Hose Branch. Completion of the building is expected in 1955.

V V V

Acme Mfg. Co. of Detroit has expanded its plant facilities with an additional 12,000 sq ft area. This is the sixth post-war expansion for Acme.

V V V

Construction is under way for a new building on the Banfield Expressway at 66th and Halsey Sts., Portland, Oregon, for Simonds Saw and Steel Co. The new facility, which will occupy 60,000

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Write for Bulletin No. 53

Hydro-Line Manufacturing Co.

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Buck TOOL CO.

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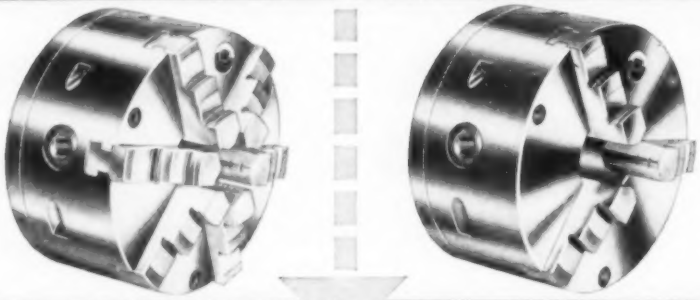

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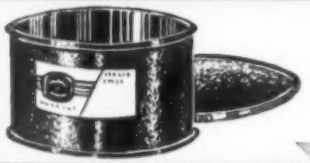

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sq ft of floor space on one level, will incorporate truck loading and receiving docks, and a rail siding. It is expected to be ready for occupancy sometime in July of this year.

V V V

Producto Machine Co. has opened a branch assembly warehouse in the Philadelphia area to provide faster die set service for that city, eastern Pennsylvania and southern New Jersey. Location of the warehouse is 214 Rock Hill Rd., Bala Cynwyd, Pa., a suburb of Philadelphia.

V V V

Mill modernization to the extent of $360,000 has been announced by the Steel Div. of Timken Roller Bearing Co. Completion date is scheduled for sometime late this summer.

V V V

Completion of a new plant at 2720 W. 14 Mile Rd., Royal Oak, Mich., has been announced by DeVlieg Microbore Co. Incorporating many design innovations, the facility, which is the company's fifth expansion in five years, utilizes 15,000 sq ft of floor space.

V V V

Michigan Bearing Co. has expanded activities with the acquisition of a new branch warehouse in Lansing, Mich. Glenn Cathey Jr. has been named manager of the facility which is located at 300 Verlinden Ave.

anniversaries

Celebration of its 50th anniversary in the machine tool field is being observed by The Thompson Grinder Co. From production of its first small universal grinder a half century ago, the company progressed into designs of massive-beaded, high precision grinders.

Christian Baldenhofer, founder of the company and then president, played a large part in the conception of crush grinding that became a patented Thompson grinding method.

V V V

Its 30th year as maker of automation machines, special machine tools and pharmaceutical machinery is being celebrated by Snyder Tool & Engineering Co. During that period, the company has grown from a business which made multiple heads and fixtures to the manufacture of its most recently delivered equipment, an eight-station machine with a 96-in. table that produces 230 automotive cast iron steering gear housings per hour.

THE TOOL ENGINEER'S *Service Bureau*

TRADE LITERATURE CURRENTLY OFFERED BY THE TOOL ENGINEER ADVERTISERS

Literature Number	COMPANY	DESCRIPTION
A-4-16	Allegheny Ludlum Steel Corp.	**High-Speed Steel**—"Cutting Tool Materials," 36-page illustrated booklet, analyzes and compares types and covers grade selection for major classes of cutting tools, etc. (Page 16)
A-4-194	American Broach & Machine Co.	**Broaches**—Catalog 450 discusses the advantages of American broaches. (Page 194)
A-4-4	The American Tool Works Co.	**Duplicating Lathes**—Bulletin 35 shows examples of economies derived from use of American lathes. (Page 4)
A-4-216	B. C. Ames Co.	**Dial Indicators**—Ames catalog discusses micrometer dial indicators and gages. (Page 216)
A-4-62	The Bellows Co.	**Air Cylinders**—Catalogs SP-50 and CL-50 contain full data and specifications on Bellows' air motors. (Page 62)
A-4-40	The Blanchard Machine Co.	**Surface Grinders**—Fourth edition of "Work Done on the Blanchard" and "The Art of Blanchard Surface Grinding" are available on request. (Page 40)
A-4-225	The Bodine Corp.	**Automatics**—Bodine brochure discusses case histories of users of Bodine machines. (Page 225)
A-4-237	Cadillac Gage Co.	**Gage Setters**—Complete data is obtainable on the Cadillac Pla-Chek gage line. (Page 237)
A-4-262	Carboloy Department of General Electric Co.	**Carboloy Dies**—Die Engineering Manual D-124 discusses the production advantages available with cemented carbides die parts. (Page 262)
A-4-23	Colonial Broach Co.	**Broaches**—Bulletin PA-52 discusses broaching and swaging in one operation. (Page 23)
A-4-280-2	Comtor Co.	**Dial Hole Gage**—Bulletin 48 tells of the unique advantages of gaging holes with Comtor measures. (Page 280)
A-4-25	Delta Power Tool Division, Rockwell Mfg. Co.	**Cabinet Model Metal Cutting Lathes**—Catalog contains information of the new Delta 11" Metal Cutting Lathe. (Page 25)
A-4-259	Dudco Division The New York Air Brake Co.	**Fluid Power Equipment**—Catalogs contain information on Dudco 2000 psi pumps, 5000 psi pumps, motors, and pumps and valve panels. (Page 259)
A-4-277	Eastman Kodak Co.	**Contour Projector**—"Kodak Contour Projectors" discusses the advantages of the Kodak projector. (Page 277)
A-4-246-2	Elgin National Watch Co.	**Rotary Tools**—Booklet points out the variety of shapes and sizes and tells how many operations can be performed with Elgin rotary tools. (Page 246)
A-4-193	Ettco Tool Co., Inc.	**Multiple Drill Press Heads**—Bulletin 600 discusses the new Ettco-Emerick flex-shaft adjustable spindle multiple head. (Page 193)
A-4-36	Ex-Cell-O Corp.	**Grinder Spindles**—Catalog 25962 lists many standard grinding spindles. (Page 36)
A-4-5	Hardinge Bros., Inc.	**Toolroom Lathes**—Bulletin HLV describes the versatility of the Hardinge Model HLV 10" lathe. (Page 5)
A-4-205	Hydraulic Press Mfg. Co., Hydraulic Power Div.	**Hydraulic Components**—Bulletin 1101 is a complete condensed catalog of H-P-M hydraulic equipment. (Page 205)
A-4-257	S. C. Johnson & Son, Inc.	**Coolant**—Booklet informs how to eliminate coolant odors with TL-131 cutting coolant. (Page 257)
A-4-61	Frauenthal Div. Kaydon Eng. Corp.	**Turning and Grinding Machine**—Information on the 3100 series precision turning and grinding machine is contained in bulletin 301. (Page 61)
A-4-45	Kearney & Trecker Corp.	**Milling Heads**—Catalog TD-10 gives details of the new TRI-D Milling Head. (Page 45)
A-4-273	Krueger-Barnes Corp.	**Special Machines**—New booklet illustrates and discusses recent KB machine tools. (Page 273)

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A-4-243	Lindberg Engineering Co.	**Motor Generator Equipment**—Specifications and performances of motor generator equipment for all induction heating applications are discussed in Bulletin 1460. (Page 243)
A-4-218	Linde Air Products Co., Div. Union Carbide and Carbon Corp.	**Flame-Plating**—Plating of worn plug, ring and air gages is described in booklet. (Page 218)
A-4-231	Lipe-Rollway Corp.	**Bar Feeds**—Twenty-four-page illustrated booklet, "The Important 4th Dimension of Production and Profit" is available. (Page 231)
A-4-217	Lobdell United Division United Engineering and Foundry Co.	**Grinding and Cutoff Machines**—Two new bulletins, "Bridgeport Line Grinding Machinery" and "Bridgeport Abrasive Cutoff Machines," are available on request. (Page 217)
A-4-281	Logan Engineering Co.	**Lathes**—A full description of the new Logan 14" lathe is given in Bulletin 14-L. (Page 281)
A-4-204	C. A. Norgren Co.	**Metal-Cutting Lubricants**—Spray-Lube Brochure 491B gives facts on applications of Norgren Spray-Lube. (Page 204)
A-4-233	The Ohio Knife Co.	**Machine Ways and Wear Plates**—Bulletin shows seven standard cross-sections in over 60 sizes. (Page 233)
A-4-190	Pope Machinery Corp.	**Precision Spindles**—Pope heavy-duty wheel-head spindles are described in catalog 59. (Page 190)
A-4-247	R and L Tools	**Cutting Tool Components**—New catalog discusses turning tools, knurling tools, tap and die holders and recessing tools, etc. (Page 247)
A-4-195	Reed Rolled Thread Die Co.	**Thread Rolling Equipment**—Bulletin 5-3T discusses all phases of thread and form rolling. (Page 195)
A-4-232-3	J. A. Richards Co.	**Benders**—A description of and advantages from Multiform Big Brother benders are given in illustrated folder TE-5. (Page 232)
A-4-239	Rivett Lathe & Grinder, Inc.	**Hydraulic Valves**—Hydraulic catalogs 204 and 260 give complete specifications and drawings of Rivett valves. (Page 239)
A-4-186	Omer E. Robbins Co.	**Sine-Bars**—Magna-Sine catalog shows all styles and sizes and includes price list. (Page 186)
A-4-179	The Rotor Tool Co.	**Pneumatic Impact Wrenches**—Bulletin 52 discusses new Rotor J-4S ⅜" impact wrench. (Page 179)
A-4-264-3	Geo. Scherr Optical Tools, Inc.	**Optical Jig Borer**—Catalog 8089 tells the advantages and specifications of the Leitz optical jig borer. (Page 264)
A-4-170	The Sentry Co.	**Electric Heat-Treat Furnaces**—Catalog P-46 tells the full story of Sentry furnaces and Sentry diamond block method. (Page 170)
A-4-174	Sheldon Machine Co., Inc.	**Lathe**—Catalog G-55 shows new 10", 11" and 13" swing, bench, cabinet and pedestal mounted Sheldon precision lathes. (Page 174)
A-4-209	Sibley Machine & Foundry Corp.	**Drilling Machines**—Catalog 68-A describes Model D drilling machine, Model D-24" and 28" swing drilling machines. (Page 209)
A-4-238-1	Standard Shop Equipment Co.	**Set-Up Appliances**—Bulletin A-85 describes Standard's line of machine tool set-up equipment. (Page 238)
A-4-65	The L. S. Starrett Co.	**Precision Tools**—Complete line of mechanics' hand measuring tools, precision instruments, dial indicators, etc. is contained in 75th anniversary catalog. (Page 65)
A-4-210	Sutton Tool Co.	**Collets and Feeders**—Twenty-six-page catalog describes Sutton collets and feeders. (Page 210)
A-4-234	Valvair Affiliate Sinclair-Collins Valve Co.	**Air Power Equipment**—Bulletin A-14 discusses Valvair's equipment. (Page 234)
A-4-9	The Wade Tool Co.	**Hand Screw Machine**—Circular discusses new Wade No. 73 hand-screw machine. (Page 9)
A-4-196	Wesson Co.	**Carbide Tools and Holders**—Bulletin 552-M gives specifications, prices, etc. of the standard Wesson Multicut holders for throw away inserts.

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abstracts of

By M. Kronenberg
Consulting Engineer

Machine Tool Utility

Companies manufacturing large turbine wheels, generators and similar machinery often require heavy machine tools although the need for them is only intermittent. To overcome the extreme between either having such machine tools idle for a considerable time or wholly unavailable, a Swiss firm has developed equipment which can be used either as special machines for large workpieces or as standard machines for average work. Victor Frey in an article in *Industrielle Organisation*, No. 8, 1954, describes lathes and milling machines built by or for his company which can be adapted to various sizes of workpieces.

Of particular interest is an electronically controlled milling machine used for machining Kaplan turbine wheels. The machine consists of two parts; namely, the copying device and the milling machine proper. They can be coupled by mechanical and electrical means so a central feeler controls the motions of the carriage crosswise to the surface of the wheel. The milling cutter is held parallel to the machined surface by two feelers which trace the model workpiece. The reason for this is that the shape of the workpiece makes it necessary to avoid cutting forces perpendicular to the wheel surface. A cantilever arm is employed for milling these surfaces.

The machine can be used for standard work when no Kaplan turbine wheels are being processed.

The change-over is accomplished by arresting and blocking the cantilever arm. In addition, with the aid of optional equipment it is also possible to use the milling machine for gear cutting operations and similar jobs.

The Swiss Viewpoint

In the same issue of *Industrielle Organisation* a young Swiss engineer compares the American machine tool industry with the industry of Switzerland. His main impression is that Americans

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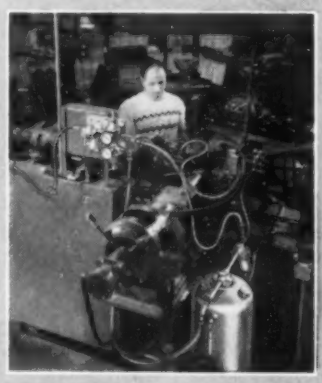

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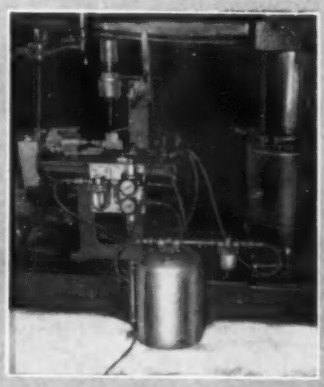

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still think of Switzerland in terms of homemade watches and hand crafts-manship of wooden furniture, unaware that a substantial portion of the population of Switzerland is employed in heavy industry. The letter concludes with the suggestion that a greater exchange of travelers would result in a more mutual understanding.

Jig Boring Machines

The present status of European jig borers is surveyed in an article by Kurt Haeuser in Issue No. 12, 1954 of *Werkstatt und Betrieb*." Accuracy of these machines depends largely on rigid design, freedom from vibration, accurate lubrication, precision of the co-ordinate systems and the optical instruments employed.

The accuracy has increased considerably in recent years and is substantially better than tolerances established by Schlesinger. The author presents comparative data on machines made by Hauser-Switzerland, SIP Switzerland, Leitz-Metzlar, Lindner-Berlin, Oerlikon-Switzerland, Burkhardt and Kolb-Cologne.

Microscopes permit magnification to 30 diameters and are built into the main spindle. The turntables can be set with an accuracy of ± 15 seconds of an arc. The manufactured parts may have a tolerance of 40 millionths of an inch.

Milling Machine Design

An article on milling machine development and design by F. Pohl in the same issue of *Werkstattechnik und Betrieb* discusses the reduction in heat concentration, back-lash eliminators, spindle bearings, guideways and other details.

Atomic Safety Instruments

Instruments for measuring radioactivity in shops and in the field have been developed by the Swiss industry in cooperation with the Swiss War Department according to an article in Issue No. 1, 1955, of *Technica*. Various instruments are described and illustrated, representing a development of the well-known Mueller-Geiger counter. Where these counters would fail due to the high frequency of the discharge (say in the range of about 1,000,000 discharges per minute) a dual system is available in which only every second or third or even every eighth discharge is measured.

Some of the instruments are also employed for measuring the thickness of paper, foils, rubber, wall thickness, corrosion and for other similar purposes.

Contamination of the air can be meas-

by placing a special instrument permanently on the roof of a plant. Other devices permit testing of drinking water, while a counter in the shape and size of a fountain pen is designed to determine degree of contamination for the protection of persons exposed to radioactive rays.

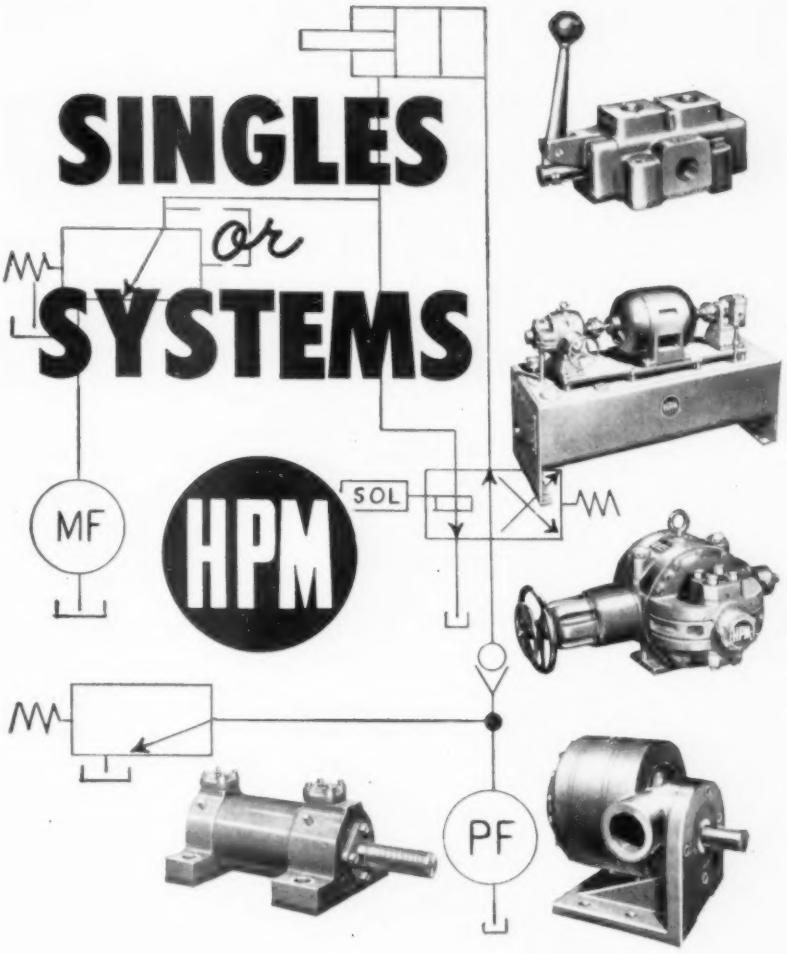
Application of Mathematical Statistics

In the same issue of *Technica* as quoted, an article by Erich Soom discusses in everyday terms the application of simple mathematics to shop problems of a statistical nature. As an example, the author selects turning a workpiece on automatics. He begins with the relationship between diameter and cutting time, which is of course indefinite because of influences of material, tools, cutting speed, etc. He shows, however, by further analysis which quantity has the greatest effect, how this quantity can be determined, and how the accuracy of predetermination can be increased by taking additional items into consideration. The error decreases rapidly when the length is taken into consideration, and even further when the material is considered. Another increase in accuracy is obtained by including the tool in the statistical survey. The number of pieces has no substantial effect on the result.

Another example is concerned with the arrangement of machine elements for ease of operation. The author assigns factors to various designs. For instance, quality number 1 is assigned when the entire metal-cuttinng process can be well observed by the operator without straining his body. Quality number 2 indicates the machining operation can still be easily observed, however, at some body strain for the operator. Poor operational facilities are indicated by number 4, which is a geometrical progression (the square of 2). This is assigned where a machining operation cannot be observed and the operator must exert considerable effort to watch the tools and the like. Such geometrical progression of quality factors simplifies mathematical analysis. The article also describes how to derive information for cost calculations in this way. It is only necessary to collect data for oil consumption, hours of operation, shape and type of charge over a limited period of time to determine the cost for the operation of a furnace.

Milan Tool Show

Discussion of the Milan machine tool show held is continued in the December issue of *Werkstattechnik und Maschinenbau*. Included are reports on lathes, automatics and boring machines.



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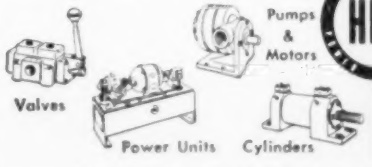

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good reading

ELECTROPLATING ENGINEERING HANDBOOK *Edited by A. Kenneth Graham. Published by Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. Price $10.00. 650 pp.*

This book contains a combination of complete and current information for all phases of electroplating. Among the subjects discussed are: processing techniques, engineering factors for constructing and installing equipment, design of parts to be plated, standards and specifications, processing sequences, testing of deposits, waste treatment, plating machinery and rinsing and drying.

Selection and treatment of subject matter were designed to make it of value to the designer, manufacturer, supplier, purchaser and user of electroplating and related equipment. A glossary, tables of data and drawings are included.

WELDING FOR ENGINEERS *by Harry Udin, Edward R. Funk and John Wulff. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price $7.50. 430 pp.*

Welding is treated in this book as a field in itself rather than as an offshoot of another field. Although the emphasis is placed on principles rather than practice, its lucid presentation equips the engineers with information and an approach to enable dealing with a variety of welding problems. Each unit process is presented as soon as possible after its basic principles have been developed.

THE FRICTION AND LUBRICATION OF NYLON, PB111510. *Office of Technical Services, U. S. Department of Commerce, Room 6227, Commerce Bldg., Washington 25, D. C. Price $0.50. 11 pp.*

This booklet gives an interim report of the findings for static and kinetic friction for steel against nylon and for nylon against nylon, both dry and lubricated. Measurements were made on "stick-slip" type of apparatus at 25 deg C. Lubricants studied included water ethylene, glycol, glycerine, fatty acids, paraffins, silicones, an alcohol, an amine, and a fluorinated acid, amine and hydrocarbon. Tables and references are included.

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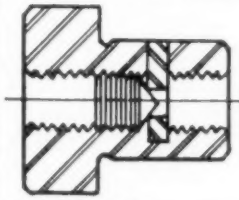
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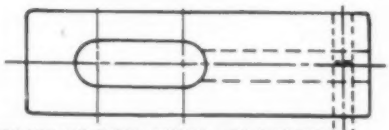
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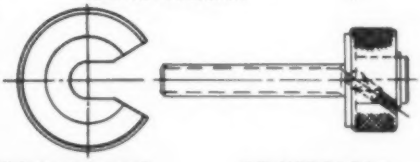
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ANCED MATHEMATICS FOR ENGI- ... *by H. W. Reddick and F. H. ... Published by John Wiley & ... Inc., 440 Fourth Ave., New York ... N. Y. Price $6.50. 547 pp.*

This book covers mathematical top- ... essential for an understanding of ... rent developments in engineering ... ory and practice. Definitions, state- ... nts of physical laws, theorems, prob- ... ms and physical units are clearly ... sented. Physical applications are ... phasized by providing with each ... rincipal topic, problems relating to ... four major engineering fields.

Included in the new material are ... iscussions for Legendre's equation, ... merical methods, Laplace transform- ... rs and the revision of power series.

HYDRAULIC PRESS ENGINEERING STANDARDS SECTION V. *National Machine Tool Builders' Assn., 2071 E. 102nd St., Cleveland 6, Ohio. Price $0.75. 34 pp.*

Contained in this booklet is a glossary of hydraulic press terms standardized by the National Machine Tool Builders' Assn. Terms are by subjects such as: types of hydraulic presses, frame elements, hydraulic cylinders, frame dimensions and accessories and controls.

PROCEEDINGS OF THE PORCELAIN ENAMEL INSTITUTE FORM, VOL. 15, 1953. *Published by Porcelain Enamel Institute, Inc., 3146 Connecticut Ave., N. W., Washington 6, D. C. Price $5. 134 pp.*

The first 35 pages of this book are devoted to papers following the theme what's new in the industry. Subjects covered include: ball mill practices, hot process screening, chalkboard enamels, electrostatic spraying, roller quenched frit, waste disposal, and special techniques and applications.

Another section of the proceedings includes the recordings of a symposium on recommended processing methods and a registration list.

THE ALUMINUM DATA BOOK. *Published by The Reynolds Metals Co., Desk PR, 2500 S. 3rd St., Louisville, Ky. Price $1, free on company letterhead. 220 pp.*

This book offers aluminum users definite information as to alloys, tempers, sizes, shapes, physical characteristics, chemical compositions, and especially mechanical properties.

The text section covers such information as rock alloys, heat treatments, casting methods, physical properties, and mechanical properties. The tables cover the following: properties of high purity aluminum, chemical properties, standard tolerances, and weight tables.

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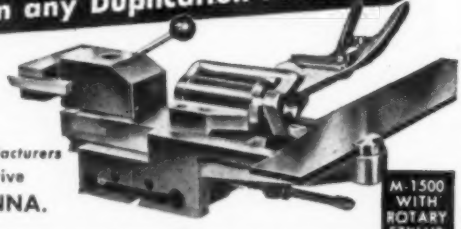

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Who's Meeting - and Where

Apr. 4-6. National Fluid Power Association. Annual spring meeting, The Broadmoor Hotel, Colorado Springs, Colo. Get complete details from association office, 1618 Orrington Ave., Evanston, Ill.

Apr. 6-10. World Plastics Fair and Trade Exposition, Inc. has been postponed until Oct. 5-9. Get complete information from executive office, 3762 Holloway Dr., Los Angeles 46, Calif.

Apr. 13-15. American Society of Lubrication Engineers. 10th Annual Meeting, Hotel Sherman, Chicago, Ill. Address requests for more details to society headquarters, 84 E. Randolph St., Chicago 1, Ill.

Apr. 13-15. Society of the Plastics Industry, Inc. Pacific Coast section conference, Palm Springs, Calif. Direct inquiries to society offices, 67 W. 44th St., New York 36, N. Y.

Apr. 16-17. Packaging Machinery Manufacturers Institute. Semiannual meeting, Palmer House, Chicago, Ill. For more facts, write institute offices, 342 Madison Ave., New York 17, N.Y.

Apr. 18-20. American Society of Mechanical Engineers. Spring meeting, Baltimore, Md. More information may be obtained from society headquarters, 20 W. 39th St., New York 18, N. Y.

Apr. 28-29. American Zinc Institute. 37th annual meeting, Drake Hotel, Chicago, Ill. Contact institute office, 60 E. 42nd St., New York 17, N. Y. for more information.

May 2-13. British Industries Fair. London and Birmingham, England. Heavy industry will center at Castle Bromwich, Birmingham. Get more information from British Information Services, 30 Rockefeller Plaza, New York 20, N. Y.

May 4-7. National Screw Machine Products Association. Annual meeting, Statler Hotel, Buffalo, N. Y. Pertinent details are available from association headquarters, 2860 E. 130th St., Cleveland 20, Ohio.

May 6. Annual Conference for Engineers, sponsored by Ohio State University, College of Engineering. Secure

...re information from Assoc. Dean ...rold A. Bolz, ACE General Chair... College of Engineering, Ohio ...te University, Columbus, Ohio.

...y 7-15. THE SOCIETY OF THE PLAS... INDUSTRY, INC. Annual meeting ...l conference to be held during cruise ... Queen of Bermuda. More informa... may be obtained from society office, ... W. 44th St., New York 36, N. Y.

May 10-12. METAL POWDER ASSOCIA...ION. Metal Powder Show and annual ...eeting, Bellevue-Stratford Hotel, Philadelphia, Pa. Write for more de...ails to society headquarters, 420 Lex...ington Ave., New York 17, N. Y.

May 16-20. AMERICAN MATERIAL HAN...DLING SOCIETY. National Materials Handling Exposition, International Amphitheatre, Chicago, Ill. Complete information is available from Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

May 18-20. PORCELAIN ENAMEL INSTITUTE. Mid-year division conference, Edgewater Beach Hotel, Chicago, Ill. Contact institute headquarters, Dupont Circle Bldg., 1346 Connecticut Ave., N. W., Washington, D. C. for details.

June 8-10. AMERICAN WELDING SOCIETY. Annual welding show, Municipal Auditorium, Kansas City, Mo. Spring technical meeting of the society to run concurrently June 7-10. For details contact society's management office, Suite 1006, 12 E. 41st St., New York, N. Y.

June 20-23. AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Semiannual meeting, Statler Hotel, Boston, Mass. For particulars contact society headquarters, 29 W. 39th St., New York, N. Y.

June 20-24. AMERICAN SOCIETY FOR ENGINEERING EDUCATION. 63rd annual meeting, Hetzel Union Bldg., Pennsylvania State College, State College, Pa. Direct inquiries to Prof. K. L. Holderman, General Chairman, 103 Mechanical Engineering Bldg., Pennsylvania State College.

June 26-July 1. AMERICAN SOCIETY FOR TESTING MATERIALS. Annual meeting, Chalfonte, Maddon Hall, Atlantic City, N. J. For more information, write society office, 1916 Race St., Philadelphia 3, Pa.

July 12-14. WESTERN PLANT MAINTENANCE SHOW, to run concurrently with Western Plant Maintenance and Engineering Conference, Pan Pacific Auditorium, Los Angeles, Calif. For full particulars, write show producers, Clapp & Poliak, Inc., 759 Monadnock Bldg., San Francisco 5, Calif.

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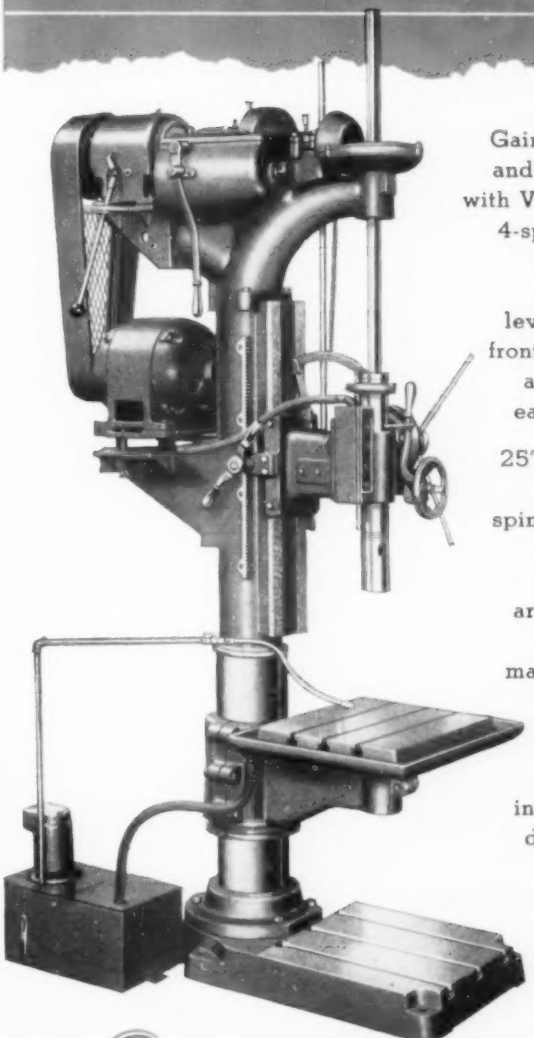

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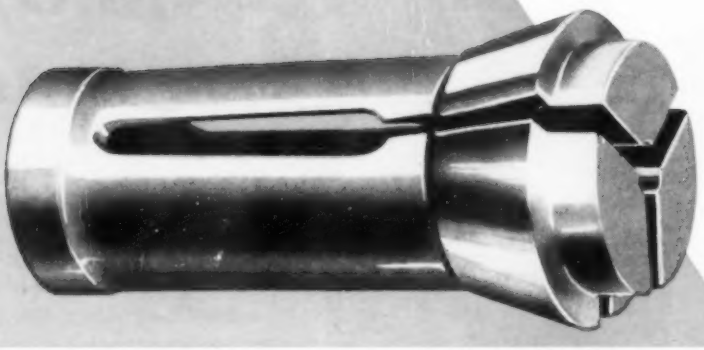

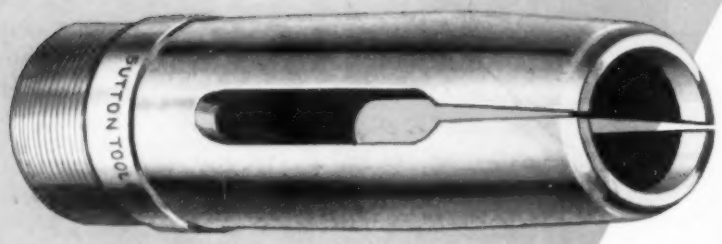

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Improving Communication of Technical Knowledge

technical digests

By Vannevar Bush
President
Carnegie Institution of Washington
Washington, D. C.

CIVILIZATION RESULTED from the fact that man learned to record and transmit and consult the record of his perceptions and his reasoning. A great step forward occurred when the invention of movable type brought low-cost printing, which in turn made possible mass education.

The greatest instrumentation from a small group to a large audience is the printed word. Much progress is being made in printing. Metal type is on the way out, although it will take some time for it to disappear completely. National newspapers, and magazines that are nearly current exert a profound influence on the public. Better methods of printing and better methods of distributing what is printed can be expected.

Progress in Warning Systems

Fire losses today are enormous. Residential fires in particular cause great loss and suffering. A dependable system would automatically call the fire department whenever there was either undue smoke or excessive heat in any part of a house. It is quite possible to build such a system now.

Soon the position of every airplane in the sky will be known centrally at all times. A similar system for the control of freight shipments and trucks would be helpful. The detail involved in such systems is of the kind that can be dealt with effectively by modern data-handling devices.

Locating Technical Information

Enormous strides are being taken in the development of methods for creating a record of what is learned—in printed words, by photography, or on a magnetic tape. Also means are being developed for the transmission of ideas from one to another or from a central point to great audiences.

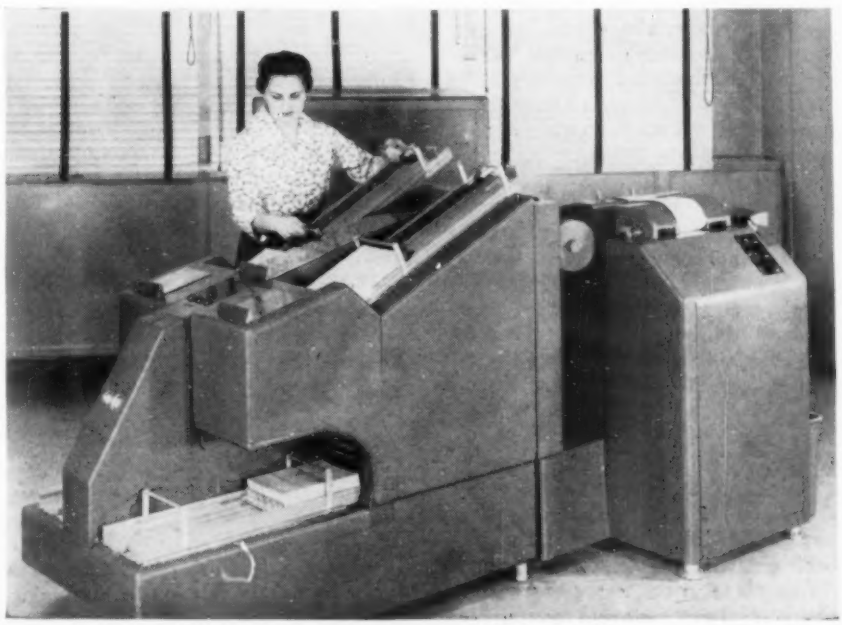
But in one exceedingly important phase of the whole problem there is little progress indeed. This is the phase of finding needed information. If records of experience are to serve well, it must be possible to extract from it at will, promptly and inexpensively, any single item of current moment. This is of great importance for the progress of science, in every professional field of activity and especially in engineering, which is daily becoming more complex in the ways in which it applies science economically to meet the needs and desires of mankind.

Records are growing at a prodigious rate. Books, magazines, technical journals, reports are being produced by the ton. Libraries are filled to overflowing, and their growth is exponential. Yet in this vast and ever-increasing store of information, particular items are hunted by horse-and-buggy methods. The result is much duplication and repetition of research. The work of thousands of able and devoted men is recorded with great care. Full of significance and timeliness to others, a large and increasing fraction of their work is, for all essential purposes, lost after it has become embedded in the mass.

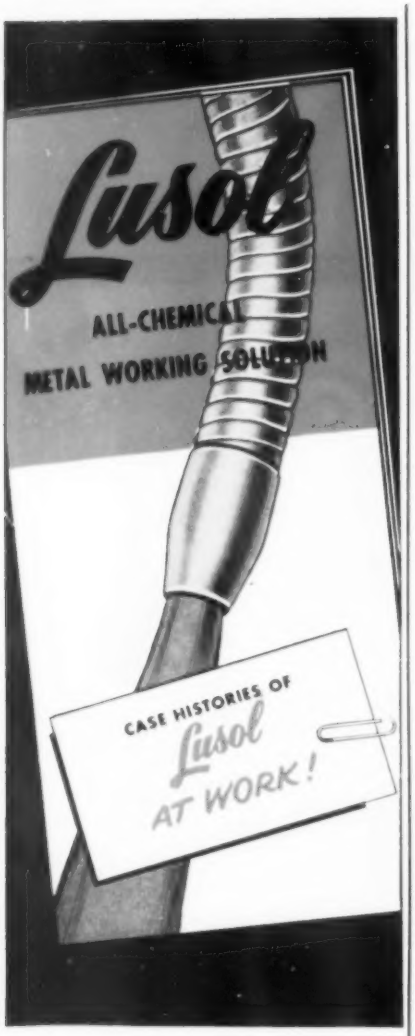
Techniques Available

The problem is not essentially one of techniques. It is rather one of deciding who is to do the job of clearing up the confusion and under what auspices. There are plenty of good techniques available. Recently a study of Patent Office mechanization problems showed several ways in which items can be scanned at the rate of a thousand a second, selected in accordance with a complex code, and reproduced automatically. Photographic methods can reduce the size of a record by a factor of one hundred to one or more, and re-enlarge on call with negligible loss of legibility, thus cramming the material of a thousand books into the space of a cigarette package.

Digital computing devices can manipulate records in the form of numbers



High speed printer and accounting machine suited for large volume tabulating and transcribing, and other data processing problems.



This leaflet tells how Lusol works to the advantage of the machine operator *and* management

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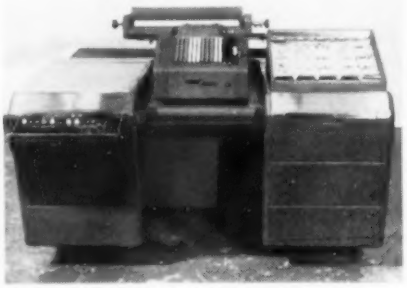
at the rate of a million operations a second if necessary. Magnetic tape can receive any kind of data, combine them, and reproduce them at will; and it lends itself to ready erasure, replacement, and rearrangement. There is no lack of powerful, versatile equipment, which is quite capable of rendering our stored records available in prompt, accurate, effective fashion, and at a distance if this is desired.

But to code scientific literature, or any other part of the mounting records and to place them under the control of machinery responsive to man's will is a stupendous undertaking. It would pay, in a practical sense, to do the job no matter how seemingly great the cost. It would pay everyone, and the expense should therefore be borne by everyone.

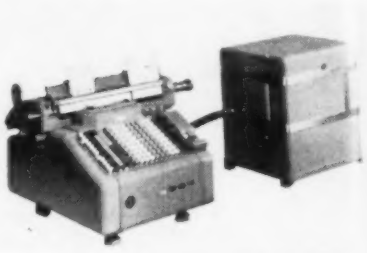


Electronic digital computer of compact size especially designed to be applied to special requirements of engineering or scientific computations as well as everyday business problems.

Thus it is a task for Government. But is it possible for a Government which cannot even mechanize its postal system to be farsighted and courageous enough to undertake a task of such complexity and such magnitude? Probably not. Methods are improving every day, and it would be a mistake to freeze upon a single system prematurely. So it probably would be unwise to plunge in at once and undertake a comprehensive and expensive program for the entire bulk of scientific literature. Various possible approaches need rather to be tried out on a more modest scale. The time has most certainly arrived when special sections of the record can be subjected to mechanization with genuine benefit to those who use them.

Improvements Coming

Further advances are coming, most interesting ones, throughout the whole range of devices by which man communicates with his fellows. Advances will be made in mastery over records, rendering them easier to consult by means which would now seem strange and bizarre. This will make obsolete much of what is now done, but will give a new power and freedom to the creative mind and open the way for another spurt forward of civilization. Civilization advances only as it acquires new experience and only as it makes its experience available and useful.



—*Photos courtesy Burroughs Corp.*

Sensimatic-to-punched-tape system provides a means of communication between machine-posted records and reports, and subsequent procedures for statistics, information and accounting.

From an address before the ASME founding anniversary meeting, New York City, Feb. 1955.

▼ ▼ ▼

New Surface Finish Specifications Needed

By L. Chaney
Development Engineer
and
C. H. Good
Production Engineer
Micrometrical Mfg. Co.
Ann Arbor, Mich.

A coordinated program to determine and standardize roughness characteristics of machined parts is a growing necessity for today's industry. This is needed because there are no adequate guideposts for a really sure surface specification. One of the difficulties in obtaining the latest data on the best finishes for a particular job is the reluctance of a manufacturer to part with information until it is obvious that competition has caught up with him.

However, below this level of recent developments in highly competitive areas, there is a vast amount of information which everyone is willing to exchange to their mutual benefit. The logical approach in the specification of surface finishes would be the establishment of some correlation of finish and performance by the same method as was used on standard fits. A similar program of collecting and correlating data is needed to establish specifications for surface finish in relation to machining methods. The major portion of the

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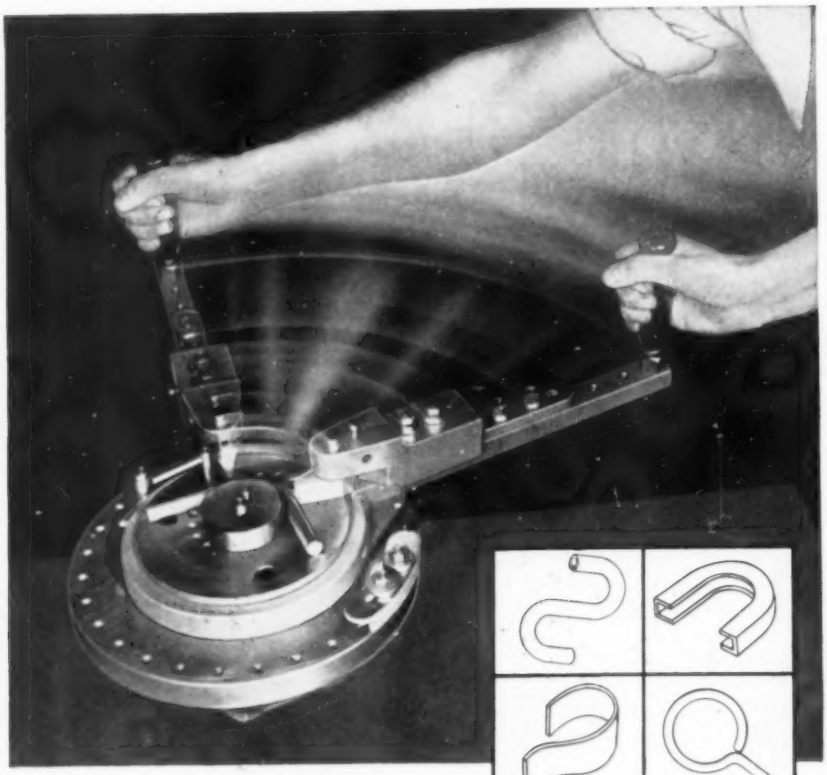

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discussion, supported by a number of tables and charts, is devoted to cutoff specifications. The roughness width cutoff is defined as the maximum width in inches of surface irregularities to be included in the measurement.

The proposed American Standards Association standard B46, "Surface Roughness, Waviness, and Lay," adequately covers the methods of measuring surface roughness. However, even the newest ideas are subject to change. As research and study go on, the standards will require alterations to include new data. Test work indicates the importance of cutoff, but no drastic change in the designation of cutoff. The wide spacing cutoff is often critical and the difference of 20 percent in spacing may make a difference of 100 percent in roughness reading.

The new proposed standard provides for cutoff specification and it is hoped that this paper will acquaint the engineer with some of the considerations involved in cutoff specification.

It is hoped that this paper will be a start toward a unified program to relate surface finish to performance and machining methods so that the field will become more of a science.

From a paper given before the annual meeting of the ASME, December 1954.

▼ ▼ ▼

New Techniques in Shielded Metal Arc Welding

by R. W. Tuthill

General Electric Co.

Use of carbon dioxide as a shielding atmosphere in inert arc welding has opened up new fields of application.

Laboratory investigations have indicated the proper techniques to use when using carbon dioxide as a shielding atmosphere to produce satisfactory welds at increased speeds and considerably lower over-all welding costs. Not the least of the factors influencing cost is spatter loss and subsequent cleaning required. These new techniques materially reduce weld spatter.

This paper discusses all factors involved together with analysis of results obtained. It is supported by high-speed moving picture studies of welding under prescribed conditions and contains the author's interpretation of phenomena seen through the camera.

From a paper given before the 1954 fall meeting of the American Welding Society, Chicago.

Production Engineering Problems Solved by Linear Programming

By **Prof. E. Leonard Arnoff**

Operations Research Group
Case Institute of Technology
Cleveland, O.

From many operations research techniques, a newcomer has emerged; namely, methods of linear programming. Despite the fact that linear programming has been in use for only a few years, it has been the prime means of solving a number and wide variety of important management problems.

Many of the decisions and plans which are made in the areas of production engineering and production scheduling are concerned with one or more of the following: determination of an optimum production program; effect of market and product mix restrictions; use of overtime or additional shifts; improvement in, or replacement of current manufacturing equipment; purchase of new manufacturing equipment (that is, over and above the replacement of old equipment); effect of changes in the sales price of a product. Linear programming can be applied to obtain solutions to such problems of production engineering and scheduling.

Changees in Unit Production Rates

Changes in unit production rates may be brought about by the introduction of new dies, special tools, new improvements in the manufacturing process, or even new machines. Linear-programming methods also can take into account the effect of such changes—even while they are in the planning stage. Thus, production need not be interrupted while such changes are being considered and evaluated.

TABLE 1 shows the optimum program for such a contemplated change; namely, reduction in the time required to produce part R in machine centers IIA and IIAA from 0.02 hr/unit to 0.0175 hr/unit.

Being able to consider such changes in advance provides one with an economic means of evaluating the worth of making these changes. Thus, as shown in TABLE 1, a saving of $2,198.80 can be effected for the given scheduling period by making the contemplated improvement. Furthermore, management is provided with a quantitative basis for arriving at a decision; namely, the prorated cost of the improvement over the scheduling period cannot exceed $2,198.80.

Thus, linear programming aids in solving a number of production problems. Methods of linear programming have been employed successfully to solve a wide variety of other management problems. The simplex method is especially noteworthy because of its power and flexibility. Not only can it be employed to solve the general linear-programming problem but, with a minimum of effort, new optimum programs can be determined which take into account added restrictions to the prob-

Table 1—Optimum Programs for Reduction in Time to Produce Part R
(t_{2A} = 0.0175 hr per unit)

Operation	Machine Center	Product R			Product S			Hours Used	Hours Avail.	Surplus Hours
		R_1	R_2	R_3	S_1	S_2	S_3			
1	I	400	57.1	300	0	0	0	757.1	850	92.9
	IIA	700			0			700	700	0
2	IIAA		100			0		100	100	0
	IIB			900			0	900	900	0
Profit: $16,000 + 1598.80 + 9600 = $27,198.80										

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GUIDE PIN BUSHINGS
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Now, you can mount Lamina guide pin bushings in standard and small die sets and realize the many advantages that only Lamina offers.

These small toe clamp type bushings were developed for use where mounting space is limited . . . designed to retain maximum die area. With bronze electroplated on hardened steel, strength is combined with free, smooth action to eliminate seizing and scoring. Full length bearing surface and precision fit assures perfect alignment and long life. Part rejects are minimized, die life is increased, press downtime and maintenance costs are reduced.

Lamina bushings are pre-finished on the inside diameter ***before*** assembly. Dimensions remain the same ***after*** assembly because the bushings are wring-fit in the die and securely held in position by specially designed retainers. Since distortion is eliminated, hand honing or fitting is not required.

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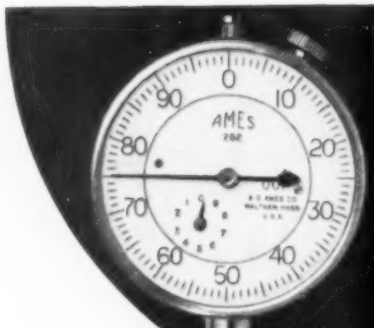

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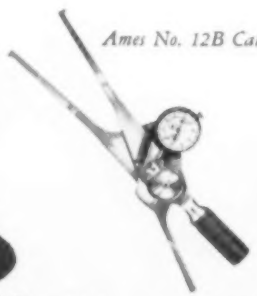

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lem or changes in the data for the problem. This is very important in that these changes and restrictions can be analyzed in advance and thus provide management with a quantitative basis for answering such questions as:

1. Addition of extra shifts
2. Overtime in one machine center versus straight time in another
3. Addition of more machines
4. Addition of new machines, special tools or improvement
5. Changes in prices to meet a competitive market
6. Cost (i.e., reduction in profits) due to producing good-will items
7. Direction of sales effort
8. Optimum product mix.

Also, linear programming is extremely valuable in that it requires systematic organization, analysis and evaluation of data in order to arrive at an optimum solution. Finally, it enables the user to readily re-evaluate his solution in terms of added or changing restrictions or other information affecting the general problem.

From a paper (No. 54-A-223) presented at the ASME Annual Meeting, Nov. 28-Dec. 3, 1954.

▼ ▼ ▼

Safety Improvements in Presses

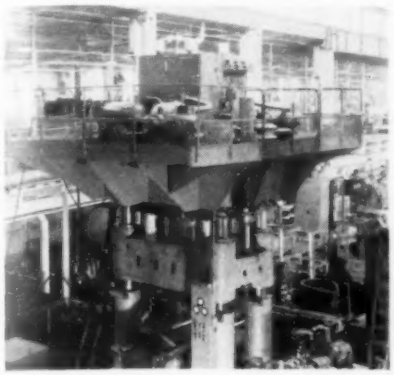
By Norman Dunlap
Minster Machine Co.
Minster, Ohio

Statistics show that many pressroom accidents occur during repair or adjustment of the machine. The amount of maintenance over a comparative period of time has been reduced by many things. Antifriction bearings have replaced bronze or babbitt wherever possible. Box-type construction has reduced crankshaft breakage by minimizing deflection. Gear wear has been reduced by running gears in oil in a guard that will support the weight, should they break or be forced off the shaft.

Guiding surfaces are replaceable and bronze faced for more accurate alignment, thus reducing impact and shock, which oftentimes results in part or die breakage. V-belt drives and gears are guarded when dangerously near the floor. Die cushions have built-in stops which prevent accidents when a press repairman removes the bolster bolts without exhausting the air. Automatic lubrication reduces wear and conse-

ently maintenance on the newer ma-chines. Counterbalance cylinders that will not only reduce shock in normal operation but also support the slide and die in the event of connection or crank-shaft breakage have also contributed to safer operation.

T-slotting of slides and bolsters with standardization of die area, flywheel



Ample working area, safety kick plates and guard rails are incorporated in this press installation to provide safe maintenance conditions.

brakes, zero speed switches, shock mounts, use of stronger materials and many others too numerous to mention have all contributed to safer press-rooms.

Without question the greatest progress made by the press manufacturers in the past few years has been in the press drives—the clutch and brake units.

A press no longer is forced to complete a cycle when it means self-destruction. The introduction of the friction drive not only affords a great deal of protection to the press, it has opened the tremendous field of press controls, which, with proper use and application, can help protect the dies and the press operators.

Many of the latest developments are being applied to punch presses through the air clutches and their controls. The electric eye, radioactivity, radio capacity, the latest "feed back" electronic circuits can be employed to protect the operator.

Interlock circuits with dual valves and dual circuits on the limit switches and operating relays are arranged for two hand controls for the operator, and in cases where more than one operator is involved a control station for each man has greatly increased operator safety. These arrangements can be made portable or located to suit conditions, which reduce operator fatigue—another cause of accidents. Incidentally, they also help to increase production.

Tension switches for limit switch

NOW! THESE NEW BULLETINS

TELL ALL ABOUT
BRIDGEPORT GRINDING AND ABRASIVE CUT-OFF MACHINES

With their recent acquisition of the Bridgeport Line, LOBDELL UNITED DIVISION, United Engineering and Foundry Company, announces the publication of these two new bulletins. One covers the Bridgeport Line of Grinding Machinery and the other explains the Bridgeport Line of "ABRASAW" Abrasive Cut-Off Machines.

In the Grinding Machinery bulletin, illustrations, specifications and features are well brought out on the complete range of sizes of Face and Knife Grinders, Vertical Spindle Surface Grinders, Traveling Head Knife Grinders and Floor Grinders.

Similar information is equally as well illuminated in the "ABRASAW" Cut-Off Machine Bulletin—also, some interesting performance data and photographic examples.

Write for copies of these bulletins to:

LOBDELL UNITED DIVISION
1836 WILMINGTON 99, DELAWARE 1955
UNITED ENGINEERING AND FOUNDRY COMPANY
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-217

Linde FLAME-PLATING NEWS

News of another successful use of LINDE'S process for applying a tungsten carbide coating to metal parts.

Flame-Plated plug, ring, and air gages have extra-high wear resistance for long-lasting accuracy.

Flame-Plated Plug Gages Outwear Carbide Gages 3-1... Hard Chrome Plated Gages 20-1!

Flame-Plating, a LINDE Service for depositing a thin coating of hard, wear-resistant tungsten carbide on metal parts and many tools, continues to be used with highly successful results on plug, ring, and air gages. The wear-resistant tungsten carbide coating, applied in LINDE'S Flame-Plating plant, gives gages lasting accuracy through a longer wear life. Flame-Plated plug gages, for example, have actually outworn solid sintered tungsten carbide gages 3 to 1...hard chrome plated gages 20 to 1.

TEMPERATURE COMPENSATION PROBLEMS REDUCED

Flame-Plated gages have the same coefficient of thermal expansion as the gage base metal. When the gage base metal is similar or identical to the part being gaged, temperature compensation problems are either greatly reduced or eliminated entirely.

CHIPPING AND BREAKAGE PRACTICALLY ELIMINATED

Flame-Plating a gage with tungsten carbide produces a hard, wear-resistant surface while retaining the toughness of the base metal. Thus, the problem of breakage is greatly minimized especially on small diameter gages. The tungsten carbide coating is also highly resistant to chipping. These factors are important advantages over solid sintered carbide gages.

AVAILABLE NOW AT LEADING GAGE SUPPLIERS

Flame-Plated plug, ring, and air gages are now available in standard AGD sizes. Plug gages from .059-in. up. Ring gages from .375-in. up. Ask your gage supplier how you can cut inspection costs with Flame-Plated gages or call the LINDE office nearest you. Send for your free copy of the Flame-Plating booklet today.

LINDE AIR PRODUCTS COMPANY, Rm. 308N
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
Offices in Principal Cities
In Canada: DOMINION OXYGEN COMPANY
Division of Union Carbide Canada Limited, Toronto

Linde Trade-Mark

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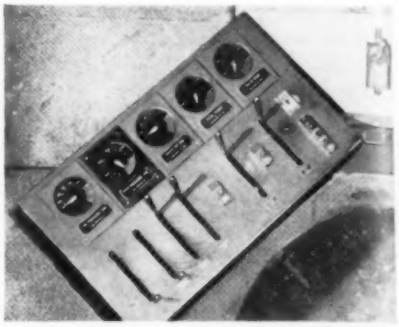
drive chains, overload devices, sensing switches in the die, part ejector mechanism, air blasts for removing the part from the press, all of these and many



—Photos courtesy A. B. Farquhar Div., The Oliver Corp.

Control panel with visible gages and convenient arrangement provides safe, simple operation as well as reducing operator fatigue.

others can be used to reduce accidents in the pressroom.

Automation of presses is eliminating manual handling of parts between operations, sometimes by progressively making a finished part in the strip before cutting it loose. It is a means of reducing costs or increasing production automatically as well as an approach toward keeping an operator's hands out of the danger zone. When this is achieved presswork will be approaching the ultimate in operator's safety.

From a panel discussion at the Power Press & Forging Section, National Safety Congress, Oct. 1954.

▼ ▼ ▼

Making Automation Dependable

By Judson H. Mansfield

Engineering Consultant
Greenlee Bros. & Co.
Rockford, Ill.

Automation in reality consists of automatic handling and machining of parts. The most common example of this is the transfer machine for such operations as milling, drilling, boring, reaming and tapping. There are many design details which contribute to continuous operation and permanent built-in accuracy. Some of these are:

- Short rigid tool spindles
- Outer supports for long spindles
- Proper seals
- Automatic lubrication
- V-belt drives from unit-drive motors
- Massive spindles, supports and fixtures to eliminate vibration and tool chatter

n the same way, there are a number features that can be incorporated safety:

Control circuits of 110 volts
Oversize contactors
Signal lights to localize troubles
Selector switches for hand operation
Individual manual controls on each unit
Emergency stop switch
Ample space between machines for tool changes and maintenance
Guards on all moving parts

Fixtures are of two distinct types. The first is for work such as cylinder blocks, transmission cases and other parts that have one or more finished faces. These workpieces are delivered to the transfer machine with two reamed holes for locating dowels.

The second part is for workpieces loaded singly or several pieces, ahead of the machine on a plate or fixture which carries them through the machine. This type is shown in *Fig.* 1.

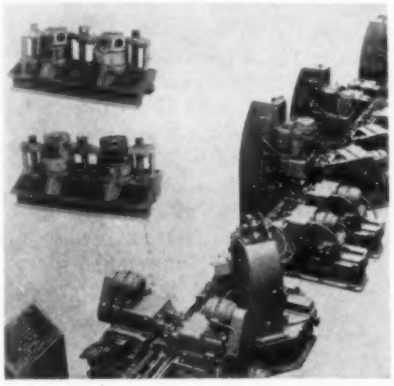


Fig. 1. Fixture and transfer machine for refrigerator compressor body. Two parts are machined at each station.

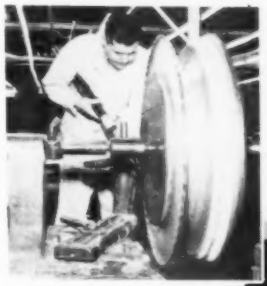
A fixture is shown at the left of the transfer machine with the refrigerator compressor body in loaded position.

Transfer machines, because of their size, look complicated. Electric and hydraulic control, however, are the same as used on standard machine tools. For example, the controls shown in *Fig.* 2 rotate the work 90 deg., load the fixture, locate, clamp, complete the cutting cycle, unclamp and rotate, unload the work to its original position. Basically, the controls are the same but more are required and they are connected in a series on a transfer machine. The usual functions of a transfer machine cycle are as follows:

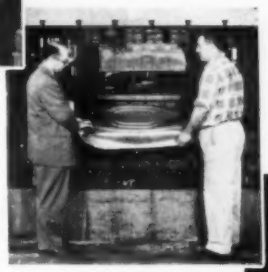
1. Transfer workpiece from station to station
2. Locate and clamp work in each station

GOODYEAR AIRCRAFT

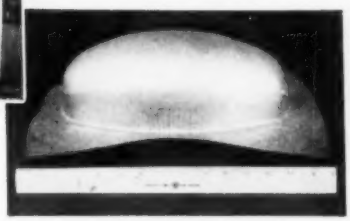
Slashes TOOLING COSTS by 50 to 75% with HYSOL 6000 Series EPOXIDE RESINS



Cast spinning chuck for spinning aluminum.

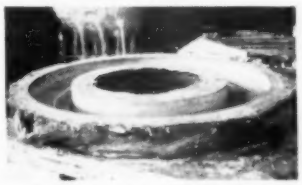


.051" thick 51S type aluminum being formed on plastic die which was cast.



.051" thick stainless steel part drawn on plastic die.

Cast plastic hand-forming assembly block.



Plaster mold used for casting of plastic.

Tool being cast into plaster mold.

Material and fabrication time are the major considerations in tooling costs. Goodyear saves 50 to 75% with HYSOL 6000 Series tooling plastics! Here's how: . . . Per volume costs are cheaper than metal. Fabrication time and expense are also cut . . . tools are produced faster and with no increase in personnel or capital investment. A plastic die can be cast or laid up directly from master die models without hand barbering or fitting, requiring little skilled labor and no expensive machinery. Time is slashed, and a tool can be completed and in use within a few days. HYSOL produces more tools per dollar than any other method and eliminates large stocks of various sizes of steel and all metal waste.

Plastic tooling may solve your problems. HYSOL plastics are useful in a variety of molding, casting, laminating, and allied applications. Our research, design, and production departments are ready to serve you. Write, wire or phone.

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115 BUSH ST. OLEAN, NEW YORK

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I've been making tools for wire and ribbon metal forms long enough to know that A. H. Nilson Fourslides are the most adaptable and produce parts most economically. For easy set-up and tool adjustment, accurate feed, and rugged design . . . Nilson Fourslides are my choice.

Look at the part shown on the left . . . made in our Nilson #S-O Fourslide. Better than 5,000 of these are produced per hour *automatically* from coiled stock using .039 dia. tin-plated copper wire, and this tops any previous production method.

I'd suggest you contact Nilson yourself and learn how you can increase production and lower costs with Nilson automatic Fourslides.

Actual Size

A.H. NILSON MACHINE COMPANY

1520 RAILROAD AVENUE, BRIDGEPORT 5, CONNECTICUT

Automatic Chain Making Machines : Staple Forming Machines : Wire and Stock Reels : Wire Straightening Equipment : Slide Feeds for Presses

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3. Rapid approach of tools to work
4. Feed tools through cutting cycle
5. Return tools clear of work and guide bushings
6. Unclamp work and indicate the machine is ready for next piece

The control circuit should prevent the starting of any function of the cycle before the previous one is completed. Means to locate the failure of any function should be included in the circuit.

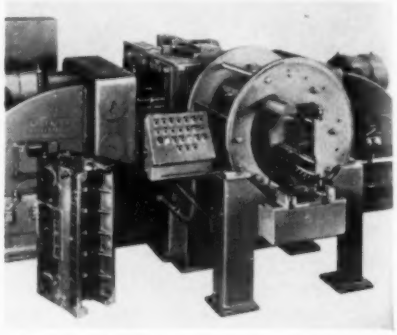


Fig. 2. Typical control panel with transfer machine.

Another typical transfer machine is shown in *Fig.* 3 for machining connecting rods. Eight rods are loaded in each of the fixtures, which weighed 1400 lb. These multiple fixtures are transferred 6 ft. from station to station in 3 sec. Nine fixtures advance each cycle. At the out end of the machine, the work is unclamped and unloaded automatically. The empty fixture then moves sideways to the return conveyor, passing through a washing machine and is returned to the loading station.

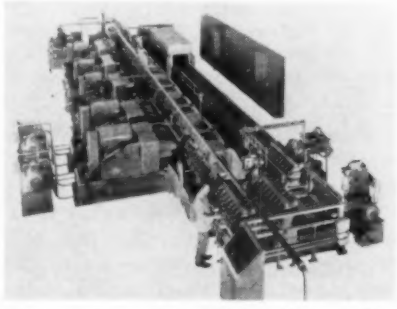


Fig. 3. Transfer machine for machining V-8 connecting rods.

These are examples of modern production transfer machines. Some quarters have become overenthusiastic about complete automatic handling and machining of parts. Many jobs can be done more economically, however, on indexing machines having stations enough for the necessary operations plus a loading station.

From a paper 54-A-78 "Designing Dependability and Safety into Transfer Machines" given at the 1954 ASME Annual Meeting.

Making Organization Function

By John L. Hammer, Jr.
Director of Marketing
Monsanto Chemical Co.
St. Louis, Mo.

No organization functions perfectly for the simple reason that it is concerned with people instead of things. One can expect consistency with most things and obtain the same results, if conditions are constant. People are never consistent and their work reacts differently from day to day.

After an organization is established, explanation must be given the people of what they are expected to do. This is the so-called description, a definition of responsibility and duties.

It is important that job descriptions be written in the plainest, shortest words possible. It must tell a person to whom he reports, who reports to him, and exactly what is expected of him.

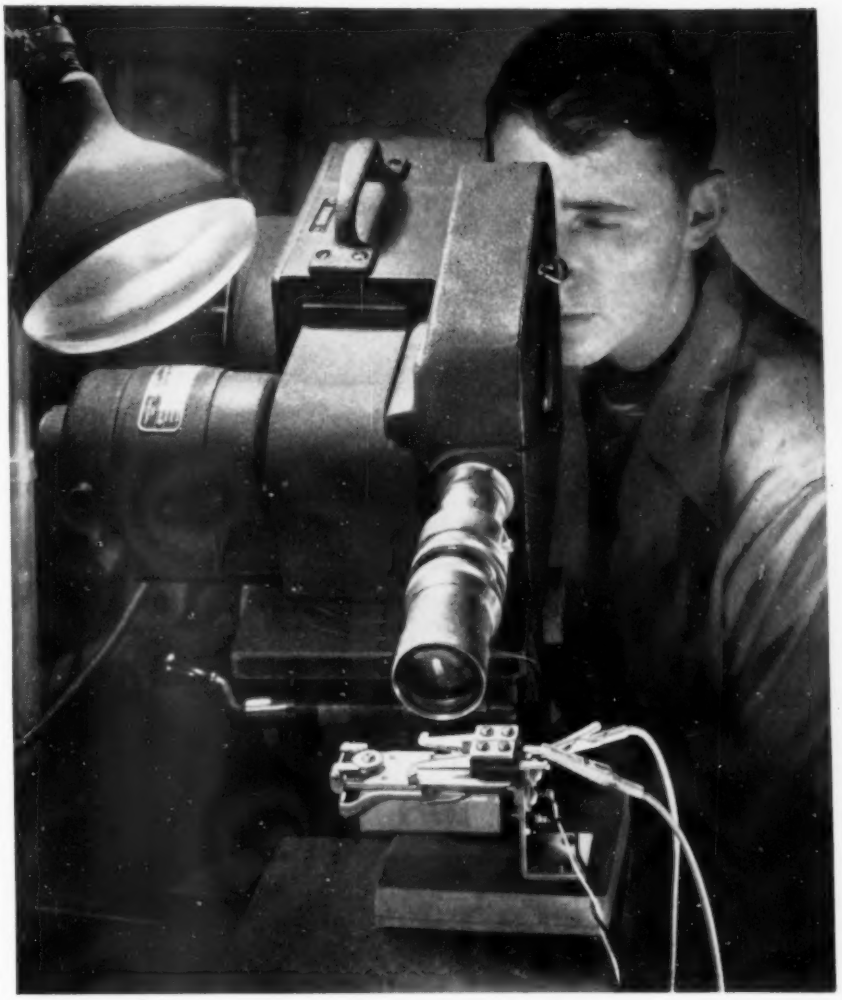
Success of the entire operation can be assured by obtaining a complete understanding of the job to be done, both by the individual himself and by the organization as a whole. Each individual should be impressed with the importance of his job in the attainment of this goal.

Because of personnel changes there is a constant problem of personnel development. This is especially necessary for advanced executive positions. Often such development takes place by horizontal moves to broaden experience. A good boss recognizes this and uses such means to develop executives who are so badly needed.

Charts and job descriptions may seem to limit a man to a specific niche. However, the human element cannot be restricted. Besides, a cross-pollination is necessary to the success of any company. For these reasons, no organization arrangement works out 100 percent according to plan.

Perhaps the most important part of implementing an organizational plan lies in proper handling of delegation of authority. This has a secondary result that is equally important. It encourages the man below by giving him a feeling of belonging that induces him to put forth his best efforts. Still, delegation is the most difficult to accomplish of anything in business. People hate to admit that a subordinate possesses the experience or judgment that they do. Success in this field is mainly a question of discussion and example.

From a paper given before the 1954 annual meeting of the American Institute of Chemical Engineers, Dec. 1954.



Eye

Each year more and more companies use super-slow-motion movies (up to 3200 pictures a second) to solve design, production, and maintenance problems involving motion too fast for the human eye to follow. Some even use such movies as a sales tool.

Kodak has just introduced a new film for this work, far more sensitive than any hitherto available. It is already contributing heavily to the achievements of specialists in the use of high speed movie cameras.

But there is one high speed camera on the market so simple that a man can use it successfully without taking time out to become a specialist. It is called, simply, the Kodak High Speed Camera. For full details about it, write *Graphic Reproduction Division* . . .

EASTMAN KODAK COMPANY, Rochester 4, N. Y.

the Kodak
HIGH SPEED Camera

Kodak

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BARNESDRIL Coolant Filters

give you **2 Stage***

COOLANT CLEANING

for selective degree of coolant clarity

BarnesdriL Engineers provide two distinct stages in coolant cleaning in the new Kleenall Unit by combining *practical magnetic separation for removal of ferrous particles, with *positive cleaning by filtration to elliminate non-ferrous or other objectionable foreign matter. With the control inherent in this method it is possible to give you the exact degree of coolant cleanliness that is practicable for your production operations. Results up to 99% removal of all coolant wastes are readily accomplished.

Complete Lab Facilities for Your Convenience

Typical microphoto of composite swarf from a high production cutting operation.

In their modern coolant laboratory, these engineers can precisely measure waste particles and classify them by physical types. Percentage of contamination is thus determined, and they are then able to select a filter media and size of unit to give you the degree of coolant clarity you desire.

Why not ask them to analyze your coolant cleaning problems and make recommendations for obtaining the most practical results. Any BarnesdriL representative will gladly supply you with complete details.

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Management Use of Quality Control

By A. V. Feigenbaum

General Electric Co.
Schenectady, N. Y.

Efforts to make quality control programs sound and effective aids to management simply depend upon real participation by factory personnel in the development of plant-wide quality control policies.

When a quality control program is complete, it should be in a position to carry on, for the entire factory organization, four quality control activities: (1) control of new designs and products; (2) control of incoming materials; (3) control of parts from machines, processes and assembly lines; (4) special studies of factory difficulties.

No quality control program is a cure-all which overnight will gain for management its product-quality objectives. Neither is it a substitute for the good manufacturing and engineering practices that have been successful over the years.

The benefits that management may gain from quality control as a management method are the following:

1. Improved product quality
2. Reduced manufacturing losses and costs
3. Better product designs
4. Elimination of production bottlenecks
5. Improvement of processing methods
6. Development of a better spirit of quality-mindedness in the plant.

It is necessary because existing, uncoordinated, individual quality techniques are simply unable to cope with customers' demands for greater precision. Quality control works through improved organization for attaining quality objectives and through more effective use of technical methods.

Properly understood, properly staffed and properly organized, quality control is increasingly recognized as industrial management's tool for pursuing one of management's key objectives—to manufacture products into which quality is built and maintained at the most economical costs, and which yield full customer satisfaction. This is the goal of organizing for effective quality control management.

From a paper given at the 1954 fall forum of the Michigan Section of A.S.Q.C. and the University of Michigan.

when it comes to AUTOMATION

This eight station multiple spindle dual loading Transfer Type Machine uses an air-hydraulic transfer mechanism. Various drilling and tapping operations are performed on cast iron carburetor throttle bodies at the rate of 450 per hour at 100% efficiency. Parts are located and clamped automatically in previously machined butterfly valve holes at each station. Parts ride free on rails between work stations. New brochure shows why, when it comes to automation . . . it pays to come to . . .

HARTFORD *Special*

THE HARTFORD SPECIAL MACHINERY CO. • HARTFORD 12, CONN.

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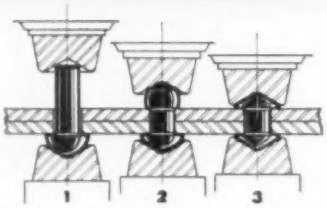
WHY HANNIFIN "HY-POWER" RIVETERS SAVE YOU MONEY

STRONGER JOINTS!

This "silent squeeze" method gives you (1) rapid advance to riveting position, (2) high-pressure shaping of the rivet, cold or hot, and (3) automatic reversal as soon as the rivet is formed. Why are these rivets stronger? Because with this method the rivet shank expands to completely fill the hole and, as the metal flows to shape the heads, fillets are formed under both heads. The rivet is work-hardened, too, and every rivet is uniform.

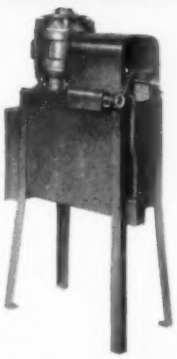


FASTER RIVETING!

Yes! From the time the button is touched it takes only 2½ seconds to head a ⅜" rivet. *"Hy-Power" is safe, too!* For the stroke can be interrupted and the ram reversed automatically anywhere in the cycle, simply by releasing the control button.

QUIETER OPERATION!

Here's the power source for this modern riveting method . . . it's the Hannifin "Hy-Power" Generator. This compact unit is a combination of motor, pump, oil reservoir, automatic control valves and high pressure intensifier that quietly supplies hydraulic pressure to...



...your "Hy-Power" cylinders—available in 7½, 10, 12½, 17½, 25, 35, 50, 75 and 100-ton capacities (more in multiple). Cylinders can either be mounted in yokes (portable or stationary) or installed in machines of your design.

GET THE FACTS!

Get Bulletin 150. Learn why cost-conscious firms in many fields use "Hy-Power." Just write for your copy of this 32-page book. We'll mail it promptly.

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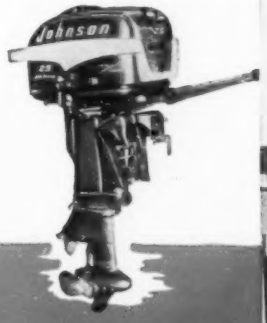
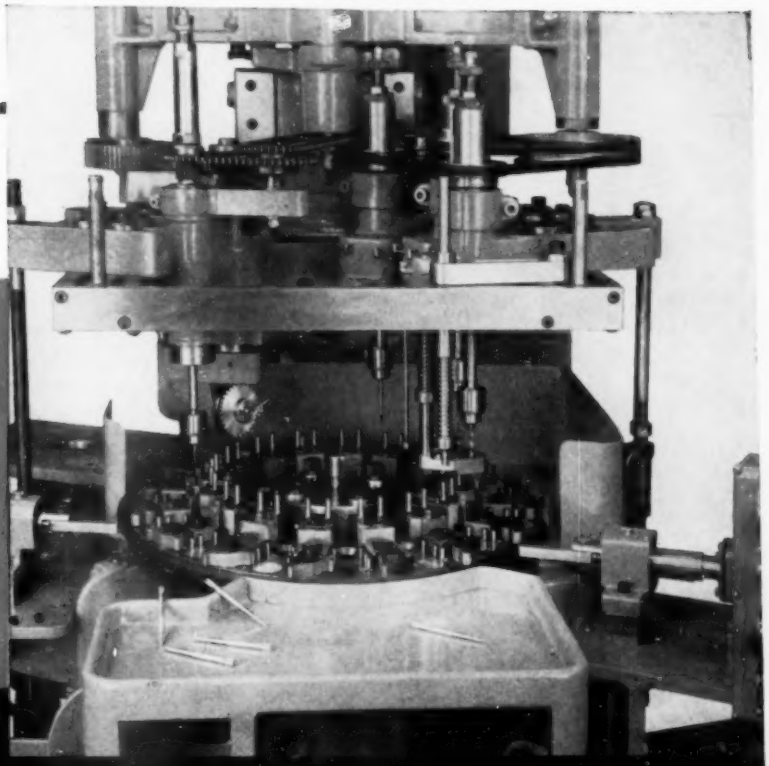
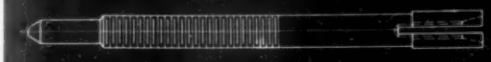


PROCESSING 3 PARTS
22 VARIATIONS
FOR
JOHNSON "SEA-HORSE"
OUTBOARD MOTOR





1. NEEDLE VALVE:

Drill hole 1 1/16" deep in top end. Countersink hole to 7/32" dia. 25° included angle. Mill .035" slot 1 1/16" deep down center axis of hole, vertical milling spindle. Tap hole 6-32 NG-2 to 7/16" deep. Production 750 pieces per hour . . . in 11 lengths . . . 2 1/2" to 4 1/2".

2. HIGH SPEED NOZZLE:

(Vertical milling spindle removed; horizontal spindle substituted.) Seven different nozzles, 1 to 3 holes of different diameters produced. Meter holes drilled through one side and a hole 1 7/16" deep in small end of nozzle. Mill 1/16" slot, 1/16" deep in top end of nozzle with horizontal milling spindle. Production, 1500 pieces per hour.

3. FLOAT VALVE SEAT:

Processed with 4 variations in the inside dia. of seat. Two I.D. diameters combination reamed to .004" (T.I.R.) concentricity with clamping dia. Valve seat rough and finish faced, depth tolerance .005". Mill 3/64" slot, 1/16" deep (horizontal spindle). Production, 1100 pieces per hour.

The three jobs detailed above are produced on the Bodine standard Model No. 41-20 . . . by means of a changeover of two horizontal indexing dials and sets of spacers for the variety of lengths of the needle valves.

All parts are hand fed, automatically positioned and clamped. The needle valves are automatically unclamped and unloaded by hand to protect the needle points. Other products are automatically ejected.

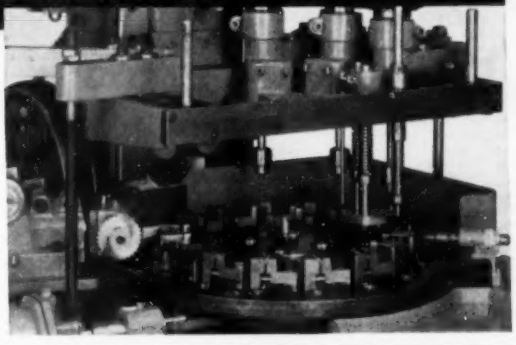
The installation of the vertical (photo above) and horizontal (photo at right) milling spindles with the other tools saved an extra handling on all three jobs.

All operations are held to close tolerances. Bodine offers 4 standard-size models which will perform Drilling, Tapping, Milling and Screw Inserting. Operations may be combined as required . . . or machines may be tooled for assembly only, with hopper feed and transfer mechanism for completely automatic production.

Bodine automatics will give you tomorrow's production today. Send us your tough problems . . . we may solve them to your competitive advantage.

Write Dept. TE-4 for the Bodine Case History Brochure.

"You Can't Meet Tomorrow's Competition with Yesterday's Machine Tools"



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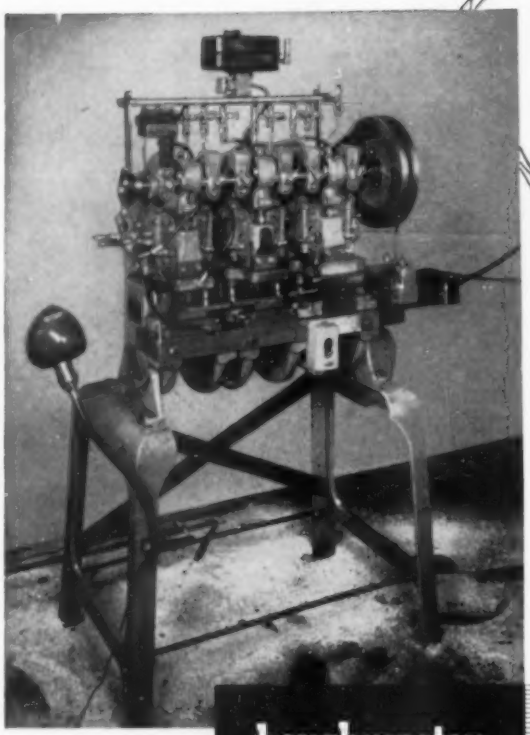
AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES



3 benchmasters

on a single crankshaft triple press output, reduce investment!

These 3 small, 4 ton Benchmasters are now doing the job of *one large press*, at a fraction of big press cost. Production is three times greater, die maintenance easier, downtime reduced next-to-nothing.

Originally the progressive die used was of one-piece construction. The first stage required frequent sharpening, necessitating complete shutdown and dismantling. Die is now divided into 3 components, each successive stage on its own Benchmaster.

When the first stage needs sharpening, a duplicate die is inserted. Press time is almost continuous, die hazards are greatly reduced. Instead of 100 strokes per minute on the old press, the Benchmasters run at approximately 300 rpm—with tripled output! This is another case of reduced costs and improved production with Benchmasters—first choice in small punch presses and mills!

benchmaster

World's largest manufacturer of small punch presses and mills.

1835 WEST ROSECRANS AVENUE
GARDENA, CALIFORNIA

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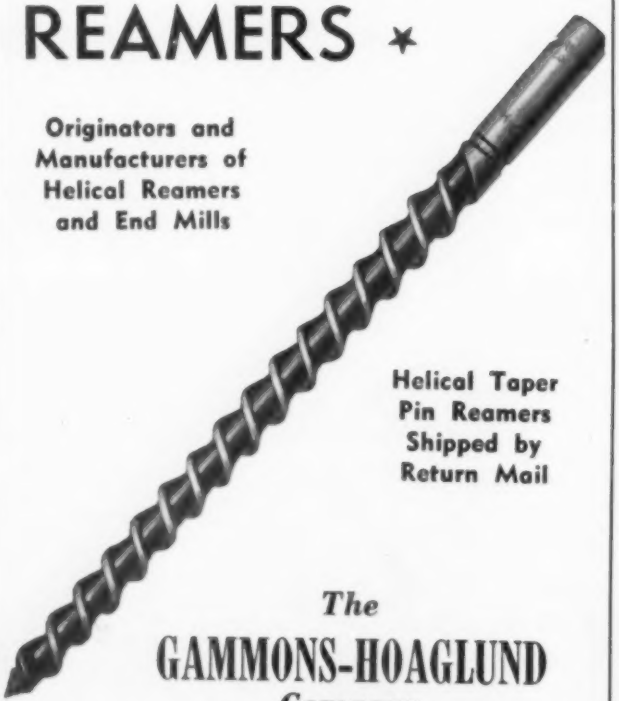
GAMMONS REAMERS *

Originators and Manufacturers of Helical Reamers and End Mills



Helical Taper Pin Reamers Shipped by Return Mail

The
GAMMONS-HOAGLUND
Company
400 Main Street, Manchester, Conn.

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THE RECORD BREAKER..

M·B "JUNIOR" 75000 R.P.M. PNEUMATIC GRINDER

Model M-CR-B

"JUNIOR" Does a Man's Size Job!

A smaller but husky model that can be used on many operations where a lighter weight tool is advantageous. Stays on the tough jobs day in and day out. 4 TYPES: 2 types of spindle extension; 2 types of air control valves; steel body; grease-sealed bearings; light weight, 12 ounces. Accommodates mounted grinding wheels, rotary files, etc. SPEEDY—Will operate Tungsten Carbide Burs, Rotary Files, etc. to their full efficiency.

Write for Literature

M·B PRODUCTS
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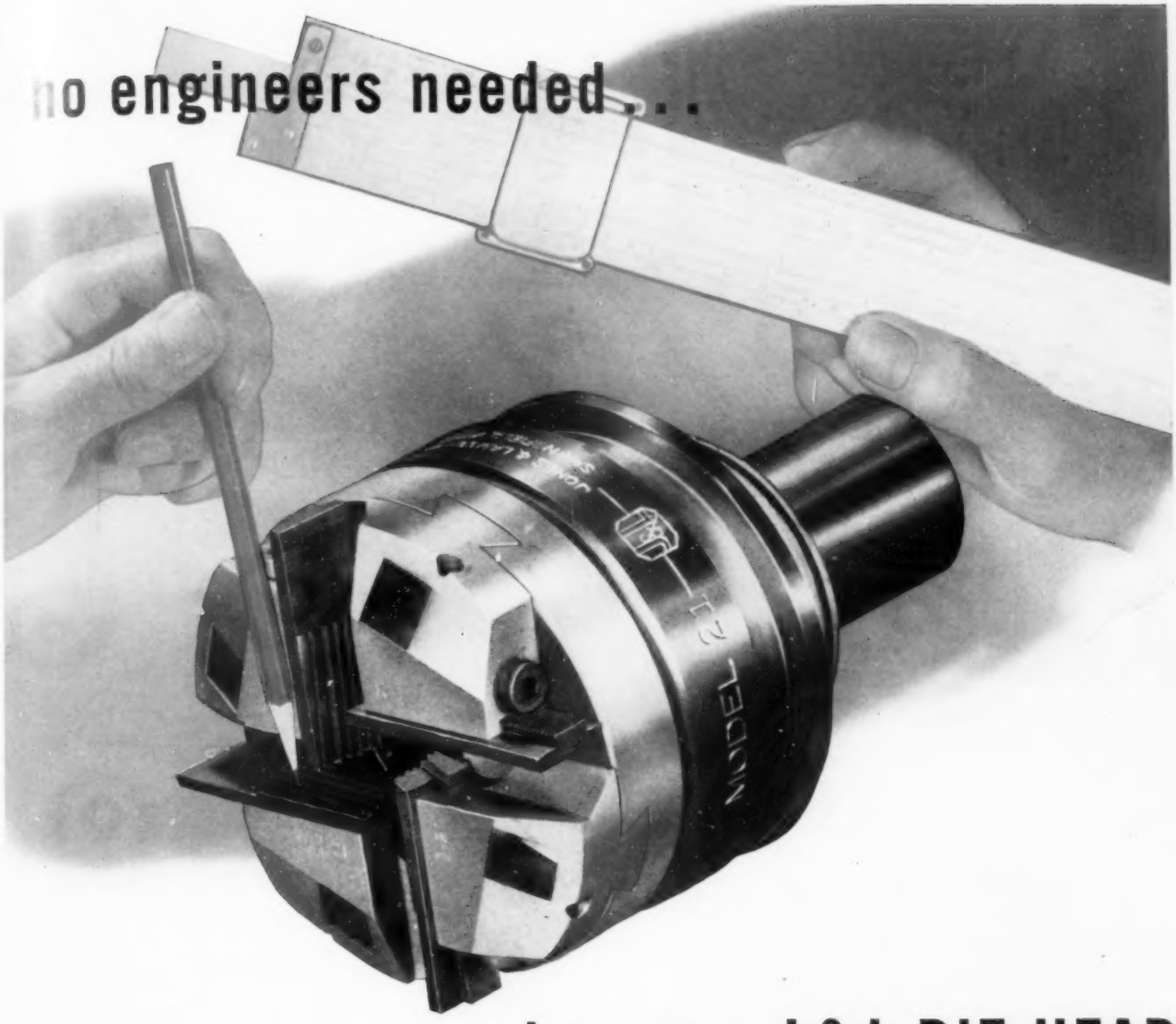
no engineers needed...



...to use a J & L DIE HEAD

Here's why...

Chasers are changed and set in a matter of seconds without disturbing the holders or die head...

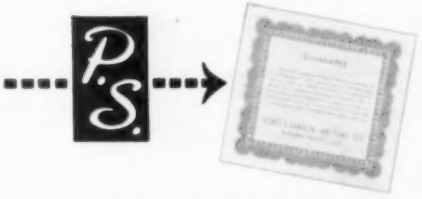
Only one set of holders is required to handle coarse, fine, or multiple threads over a wide range of sizes...

Controlled ratchet teeth provide definite points for location, locking and thrust support—making it easy to locate all four chasers in the same relative cutting position.

Best of all—the RESULTS ARE GUARANTEED... not sometimes, but *every* time. (And you get that in *writing*... Class III or better).

Disregard Class III if you like, but remember... J&L's system of *"no approximations"* adds up to even *more* savings for Class I and II.

You're paying for results... be sure you get them!



Why pay for 20 sets of ordinary chasers when you can get 20 controlled resharpenings with one set of J&L Chasers—PLUS—Guaranteed performance.

JONES & LAMSON

Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE CO., 518 Clinton St., Dept. 710, Springfield, Vt., U.S.A. J&L THREAD TOOL DIV.

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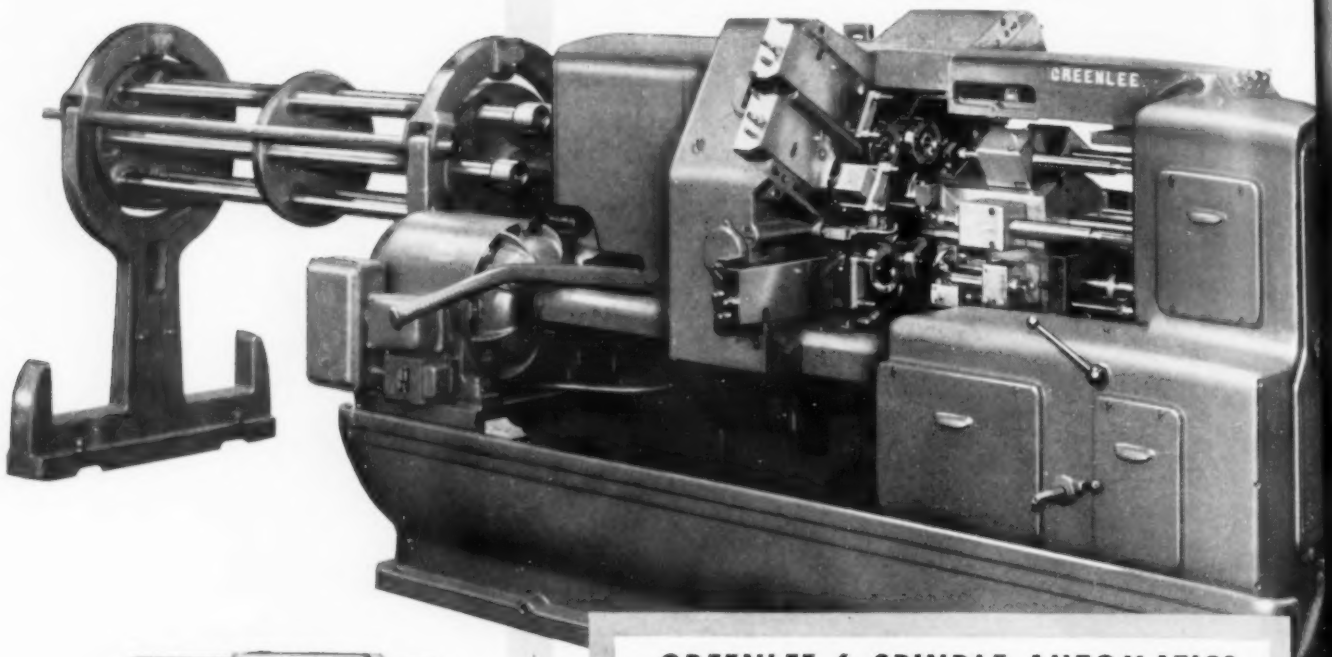
PRODUCTION MACHINERY

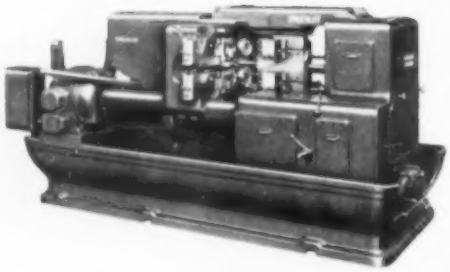
GREENLEE

AUTOMATIC BAR MACHINES

INCREASE YOUR PRODUCTION... LOWER YOUR COSTS!

CUT YOUR SET-UP TIME
SPEED-UP DIFFICULT OPERATIONS





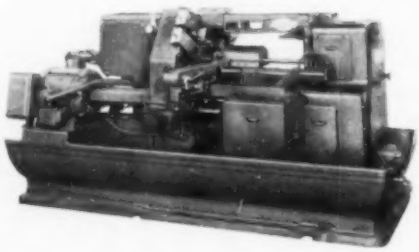
GREENLEE 6-SPINDLE AUTOMATICS
SPECIFICATIONS

Rating	1"	1-5/8"	2"
Chuck Capacity, Round	1"	1-5/8"	2"
Chuck Capacity, Hexagon	7/8"	1-13/32"	1-3/4"
Chuck Capacity, Square	3/4"	1-1/8"	1-7/16"
Stock Feed	6-3/16"	8-5/16"	8-5/16"
Turning Length	6"	7-1/2"	7-1/2"
Spindle Speed Range	225 to 2500	105 to 2175	95 to 1935
Feed Range per Spindle Rev.	.0014 to .0218	.0017 to .0388	.0019 to .043
Motor Horsepower	15	20	25
R. P. M.	1800	1800	1800
Floor space:			
Length with Stock Reel	17'-6"	17'-3"	17'-3"
Width	5'-0"	5'-4"	5'-4"
Height	4'-11"	5'-4"	5'-4"
Net Weight in Pounds	14,400	17,940	18,150

GREENLEE 4-SPINDLE AUTOMATIC
SPECIFICATIONS

Rating	2-5/8"
Chuck Capacity, Round	2-5/8"
Chuck Capacity, Hexagon	2-1/4"
Chuck Capacity, Square	1-7/8"
Stock Feed	8-3/16"
Turning Length	7-1/2"
Spindle Speed Range	120 to 1200
Feed Range per Spindle Rev.	.002 to .0458
Motor Horse Power	20
R. P. M. of Motor	1800
Floor Space:	
Length with Stock Reel	17'-3"
Width	5'-4"
Height	5'-0"
Net Weight in Pounds	17,000

GREENLEE 2ND OPERATION AUTOMATIC



Extremely versatile, high-production machines. Parts can be loaded semi-automatically or fully automatically. Incorporates the same basic features . . . inherent production and operating advantages as the standard 6-Spindle Automatics.

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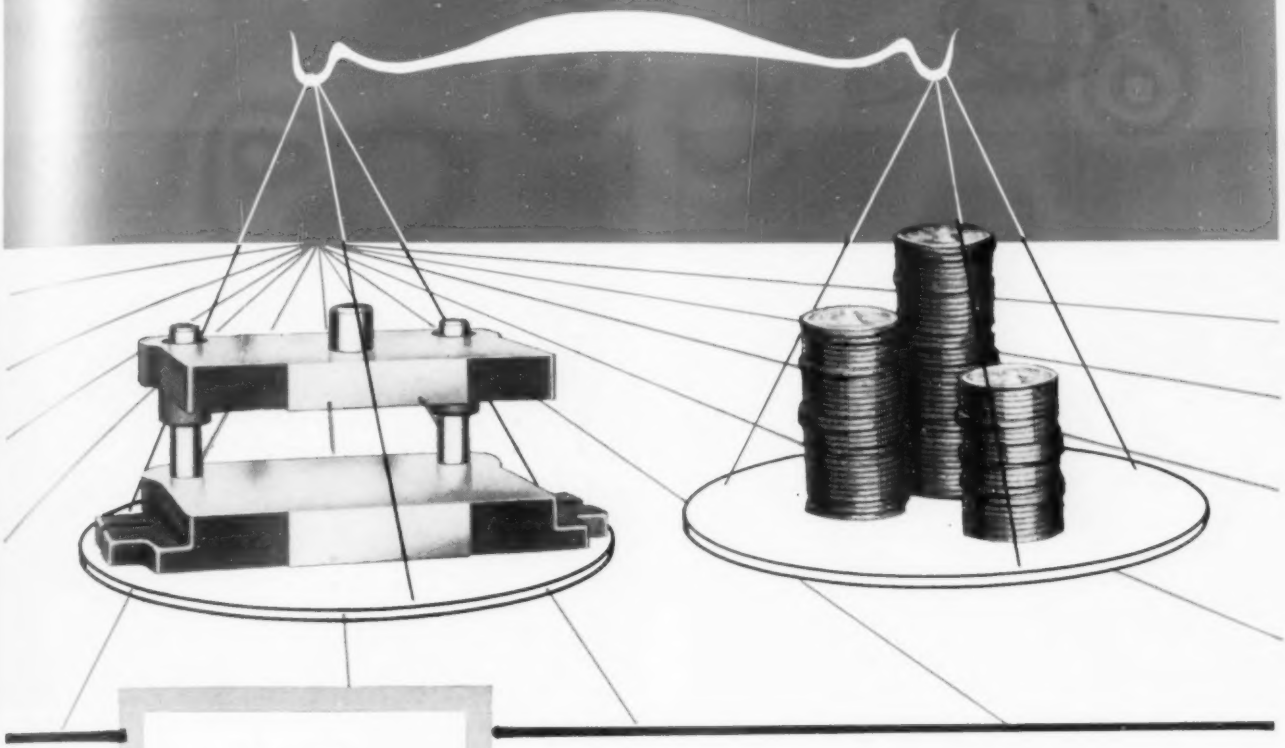
PRODUCTION MACHINERY
GREENLEE

GREENLEE BROS. & CO.
1984 MASON AVENUE
ROCKFORD, ILLINOIS

Why let th

YOU GET *full value* IN DETROIT DIE SETS



A die is no better than its die set

The big advantage of a *full-value* Detroit Die Set is that you get what you specify . . . factory-tested to assure you exact thickness of die holder and punch holder, true parallelism and squareness of surfaces, precision fit of pins and bushings. This means not only the accurate die set you expect, but also faster mounting, less maintenance, longer life. Reworking a die set in your shop can cost many times the difference between a "bargain" die set and a *full-value* Detroit Die Set. And, remember, our stock die sets are shipped within 24 hours; specials in remarkably short time.

PRECISION-BUILT ACCESSORIES

In stock for immediate delivery is an extensive range of die-makers' accessories, including the new self-oiling guide pin bushings with sealed internal oil wells for automatic lubrication of friction surfaces.

Detroit DIE SET CORPORATION

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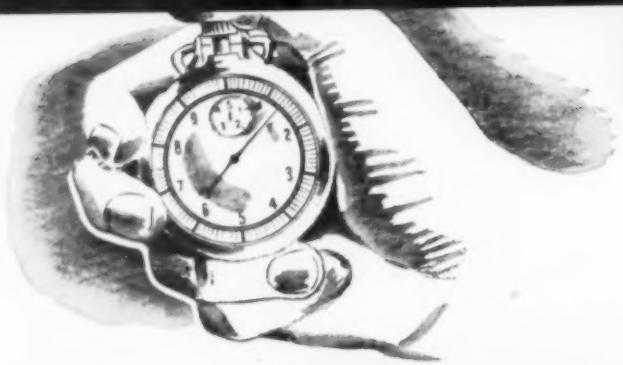
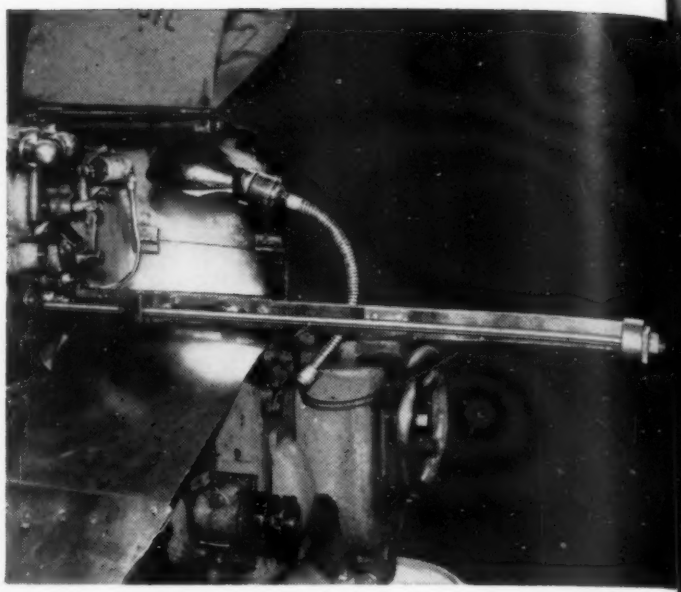
Offices in Principal Industrial Centers

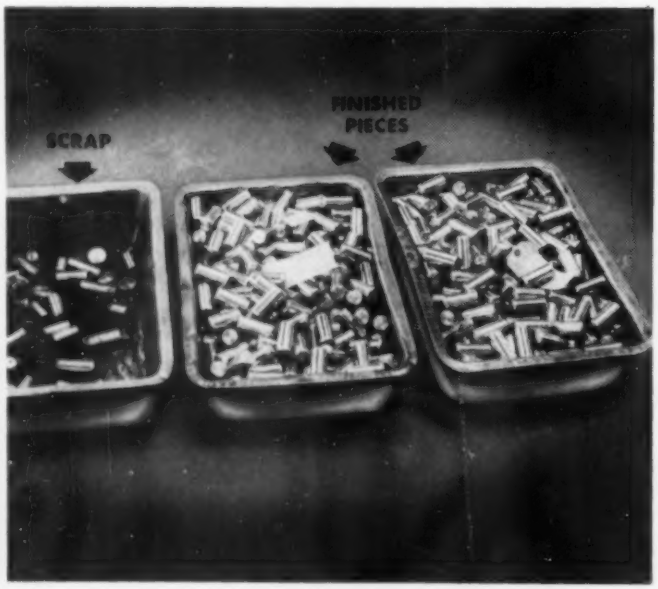


Why let the cut

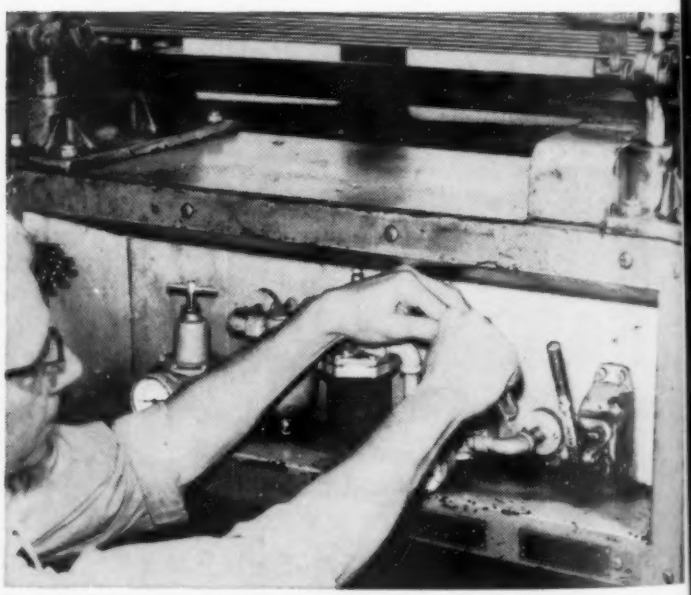
Feeds Stock Continuously . . .
there's no cutting air



No Repeat Motion . . . feeds any length in one feed-out



Reduces Scrap, Refinishing . . .
doesn't scratch or mar polished stock

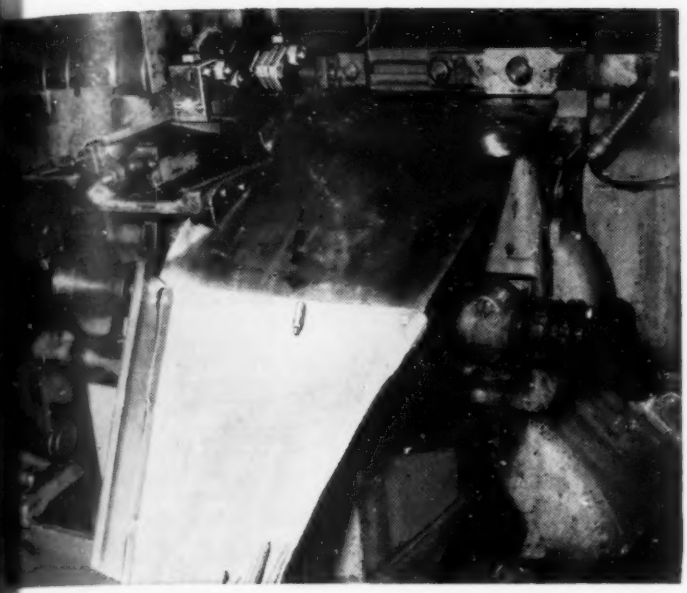


Allows Quick Set-Ups . . . no tricky adjustments for long or short runs

LIPE ROLLWAY

Lipe-ROLLWAY CORPORATION BAR FEED DIVISION

4th Dimension your production quotas?



Ejects Remnant Automatically . . . no shut-downs for remnant disposal

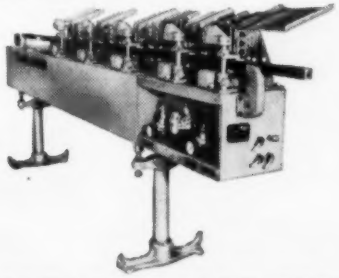
Reduces Fatigue, Slow-Downs . . . cuts nervous strain and absenteeism

Lipe A.M.L. BAR FEED boosts output 30% or more by smashing the TIME barrier

You're familiar with the three spatial dimensions on blueprints: length, width and height. But what of TIME—the important 4th Dimension that determines whether you hit or miss your production quotas?

Control Time as you control the other three dimensions—make every second perform a productive function—and you're on your way to more efficient machine use . . . new production highs . . . lower per-piece costs!

The Lipe A.M.L. (Automatic Magazine-Loading) Bar Feed converts the normal series of stop-wait-go machining cycles into one continuous, uninterrupted flow. Despite hour of day, temperature, inattention, operator skill or fatigue, it supplies stock constantly to the machine—never losing a productive second as the clock ticks on.



LIPE A.M.L. BAR FEED

The A.M.L. is an air-operated attachment which automatically feeds an 8-hour supply of bars, rods or tubing to any machine tool equipped with a stop to establish feed length. It can be put to work on practically every type of single spindle screw machine, turret lathe, centerless grinder, abrasive-wheel cut-off, punch press, cold header or die machine.

You can expect at least a 30% increase in production—that's Lipe's *guarantee*. Users report gains up to 266% due to the six features illustrated on the left. The whole story of what the A.M.L. can do for you is described in a free booklet we'll be glad to send you. Mail coupon for your copy.

LIPE-ROLLWAY CORPORATION
Bar Feed Division
Syracuse 1, N. Y.

Please send free 24-page illustrated booklet, "The Important 4th Dimension of Production and Profit."

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IF you have an ACE in the hole!
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TABLE WITH AUXILIARY UNIT

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V-MODEL TABLE WITH FOOTREST

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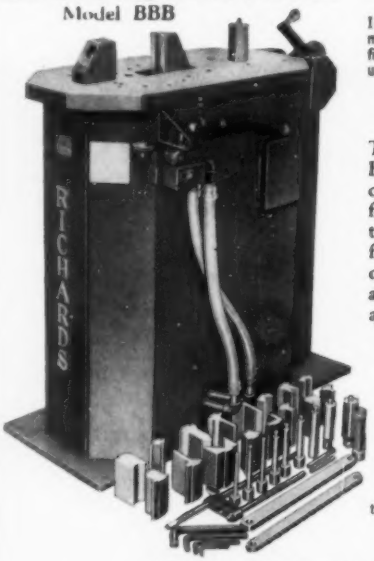
Multiform

BIG BROTHER BENDER

Produces Without Special Tooling—Saves Die Costs Saves on Expensive Presses

Model BBB



Illustrated above are a few of the many forms that can be produced efficiently on the Multiform Bender, using the standard tooling.

The heavy duty Big Brother Bender is designed for fabricating bus bars, brackets, fixtures, etc., without special tooling. Air controlled with finger tip response. Comes complete with dies, mandrels and wrenches—punching and blanking dies extra. Will punch holes up to 1" and form material up to ¼" thick by 4" wide. We also build smaller hand or air operated models for forming up to ⅜"x1½" material.

See this equipment on display at the Western Industrial Exposition, March 14-18, Los Angeles Shrine Auditorium

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Kalamazoo, Michigan

J. A. RICHARDS CO.

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*Wm. H. Ottemiller Co.
YORK, PENNA.
Ottemiller products are sold through Mill Supply Houses. Write for free folder and price information.

USE READER SERVICE CARD; INDICATE A-4-232-4

America's Newest and BEST!
TAPER SHANK KEYSEAT CUTTER

★ MADE TO OUT PERFORM ALL OTHERS
★ COMPETITIVELY PRICED

Keyseat Cutter Specialists for 33 Years

For *Accuracy* and *Long Life* these cutters will out perform any conventional straight shank cutter. Special holders for all milling machines provides the most rigid, truest running set up we have seen. We are so sure of these claims that we invite you to test these cutters at our risk. Standards or specials. Write for prices and literature and details of our no risk test offer. Dealer and Agent inquiries welcome.

QUALITY TOOL WORKS
770 S. MARKET ST. • WAUKEGAN, ILL.

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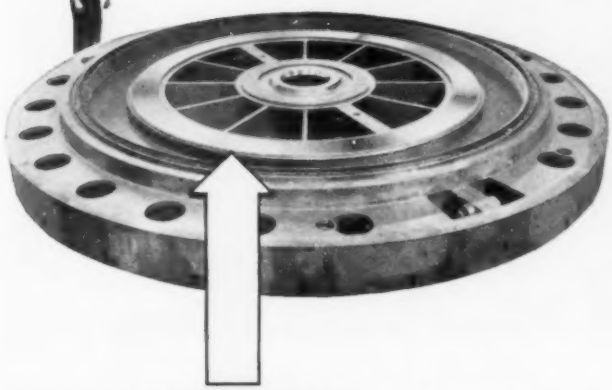
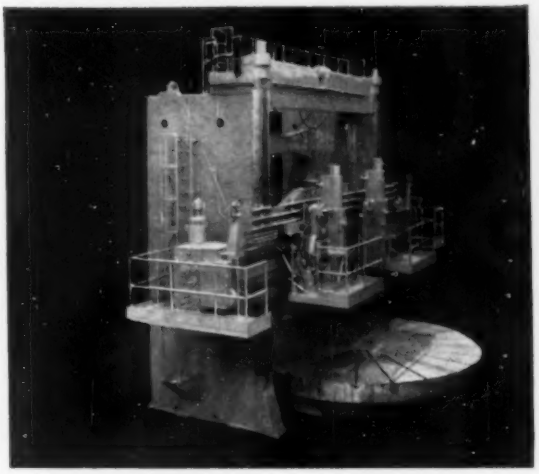
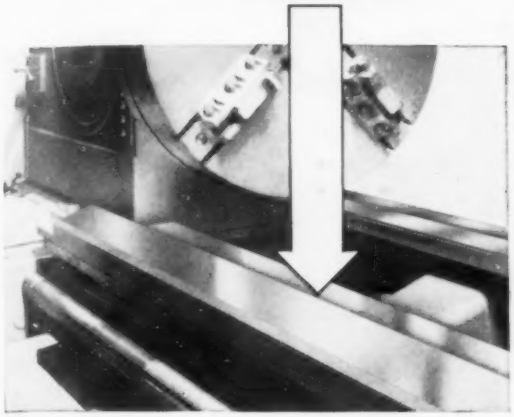
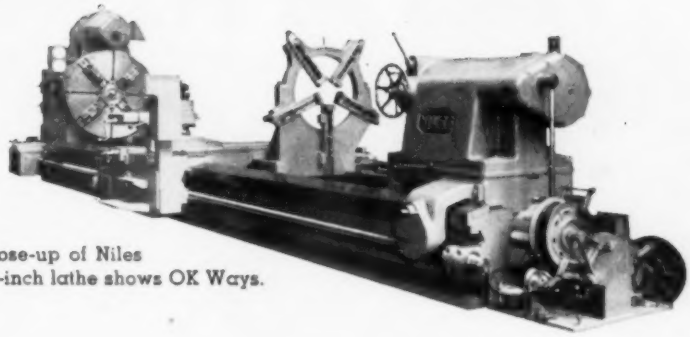
Table of Niles 20-foot vertical boring mill, inverted to show OK Wear Plates.





good ways to keep customers happy





Close-up of Niles 60-inch lathe shows OK Ways.

THE NILES TOOL WORKS . . . of the Baldwin-Lima-Hamilton Corp., is one of many U. S. machine tool builders using OK Hardened Ways and Wear Plates. Their mammoth machine tools require ways and wear plates that maintain absolute accuracy for the life of the machine. OK Ways and Wear Plates are used because our unique manufacturing and hardening processes make them virtually wear-proof.

Special-analysis tool steel is welded to a soft steel backing, resulting in a work surface of high wear-resistant properties. This process permits manufacture in long lengths without danger of bowing or warping.

Hardening is done in electronically-controlled furnaces, giving a ROCKWELL C 64-66 the full depth (normally 3/16") of the tool steel. They are precision ground to tolerances of ± .0002" with low micro-inch finish.

Make your customers happy. Insure trouble-free operation of your machines with OK Ways and Wear Plates (also available in clad aluminum bronze). Our engineering staff will assist you in your design or production problems.

For free bulletin showing seven standard cross sections in over 60 sizes, write Dept. 41-U

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Hardened Ways
Slitter Knives
Shear Blades
Cut-Off Blades
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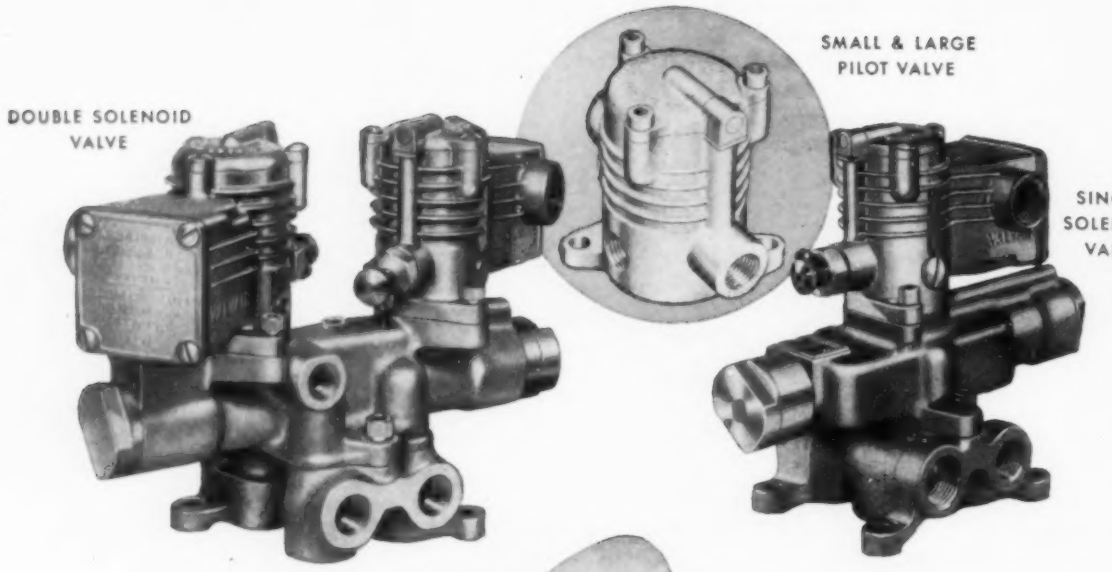
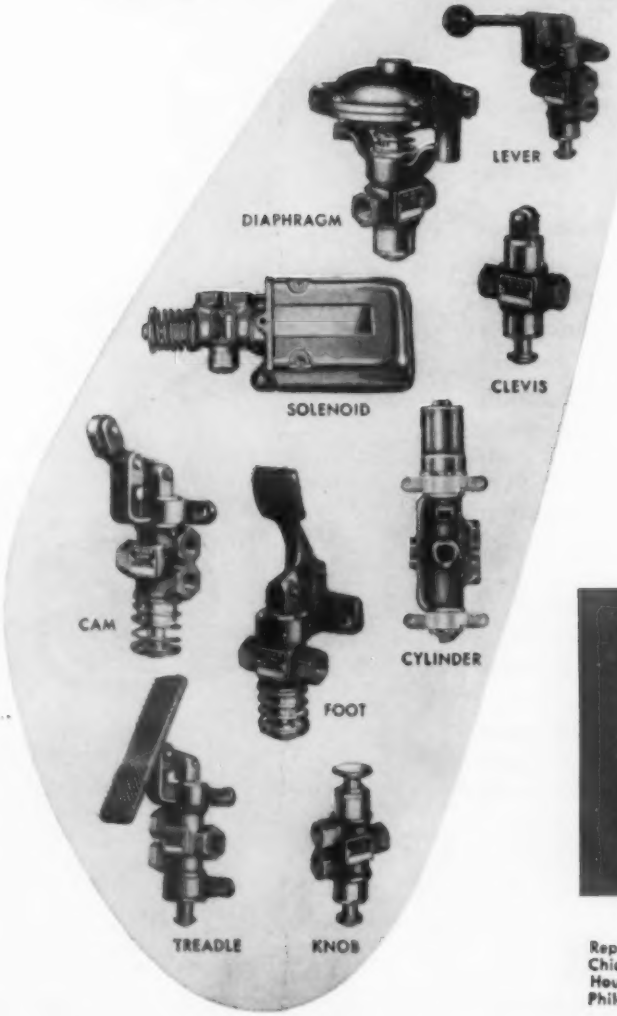
Work-Rest Blades
Wear Strips
Bronze Ways



AIRMATION BY VALVAIR



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Two Steels Are Fused By Jessop Skill To Bring You Better Dies At Lower Cost

One milestone in Jessop's drive for absolute supremacy in the realm of fine specialty steels is its unique ability to fuse together tool steel and tough, non-hardening carbon steel and then roll them into one solid inseparable die section. The advantages to this exclusive process are great. Forms resist shock better, and can be more readily shaped. Dowel and screw holes may be drilled after hardening, and cost per pound to you is up to 40% less than solid tool steel die sections. Whether or not you buy die sections, this Jessop "first" should interest you. A company that has the spirit and progressiveness to constantly search for new ways to serve its customers better is a good one to do business with. Send us an order for one of the specialty steels shown below.

STAINLESS STEELS • HIGH SPEED STEELS • NON-MAGNETIC STEELS • HIGH SPEED TOOL BITS • HEAT RESISTING STEELS • STAINLESS-CLAD PLATES • CARBON AND ALLOY STEELS TOOL STEELS FOR SPECIAL PURPOSES • CAST-TO-SHAPE TOOL STEELS • HIGH SPEED AND ALLOY SAW STEELS • TEMPERED AND GROUND STRIP STEEL • COMPOSITE HIGH SPEED STEELS • STAINLESS AND HEAT RESISTING CASTINGS • COMPOSITE DIE STEEL SECTIONS PRECISION GROUND FLAT STOCK • DIE STEELS—HOT AND COLD WORK

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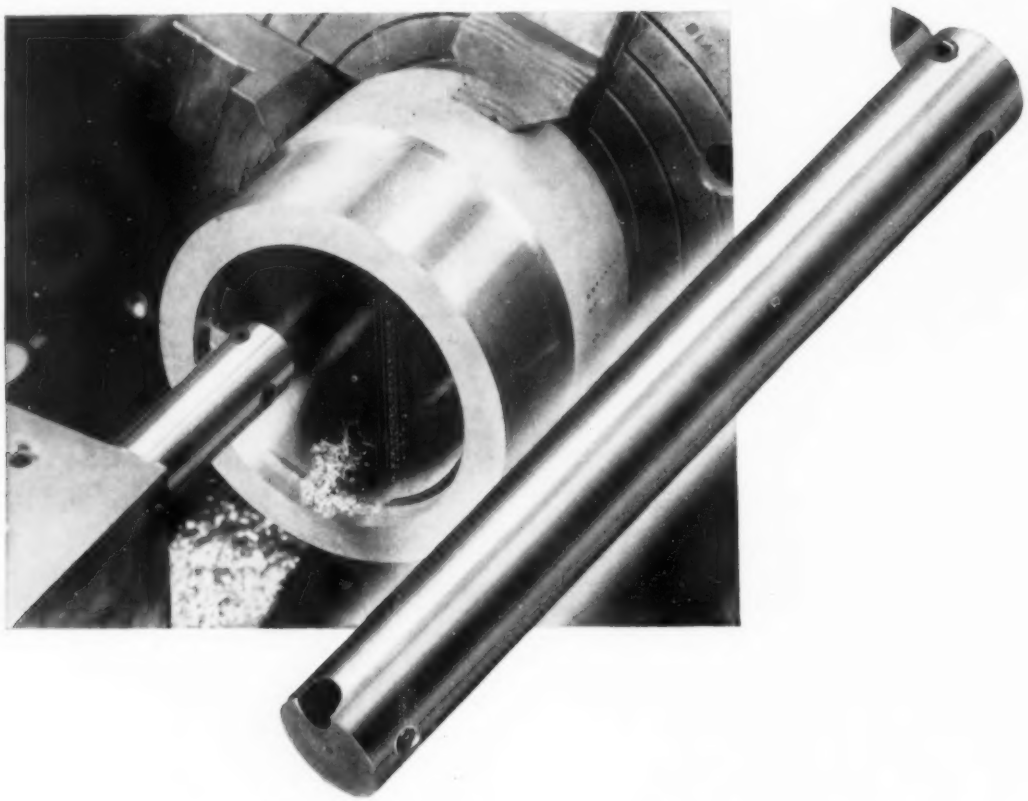
Jessop Steel International Corp., Chrysler Building, New York, N. Y.

Mallory No-Chat* Boring Bars Can Cut Your Machining Costs



HOW MUCH MONEY and time are being wasted in your shop by chattering tools?

A unique development by Mallory—*No-Chat* boring bars and tool shanks—now puts an end to this waste. Even those tough inside cuts with long overhang of the boring bar can be made with an absolute minimum of tool vibration, and at substantial overall savings in machining cost.

No-Chat boring bars are made of a special high density alloy. Far heavier, more rigid and better heat-conducting than steel, they stop vibration at its source. They cost more . . . but they quickly pay for themselves on the job.

Far more production between grinds. Tools run cooler. Wear due to vibration is drastically reduced. Down time is slashed.

More metal removed per cut. Machines can be set for heavier cuts without danger of chatter.

Cleaner finish. Reduced chatter often eliminates need for finish grinding. You don't cut chips on the way out.

No-Chat boring bars and tool shanks are re-usable. Tips are readily replaced. This unique metal does not anneal, and has no grain-growth problems.

Write to Mallory today for our Technical Bulletin giving full data on *No-Chat*, and available sizes of stock for use in the tools you are now designing.

*Trade Mark, Patent Applied For

Expect more . . . Get more from MALLORY

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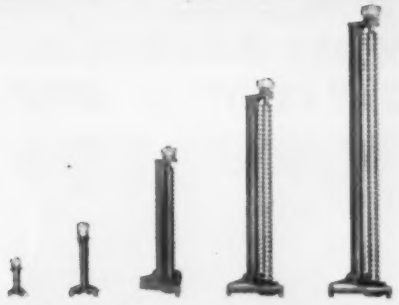
For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio

Jessop Steel International Corp., Chrysler Building, New York, N. Y.

Cadillac PLA-CHEK

Height gage and micrometer settings are 5 to 20 times faster with Cadillac PLA-CHEK than with other methods of comparable accuracy. Less than 15 seconds establishes *any* dimension within a 24″ range to limits of less than .0001″. No auxiliary gage blocks necessary—PLA-CHEK is totally self-contained. Dimensions are taken from the surface plate or from a base line on the work. Send coupon TODAY for complete details!



Cadillac PLA-CHEK Gages are available in a complete range of sizes from the easily portable 6″ and 12″ models for smaller jobs, to 24″, 36″ and 48″ models for larger inspections. Precision-made risers may be used with PLA-CHEK Gages —increasing the range of each 6″ to 12″.

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P. O. BOX 3806, DETROIT 5, MICHIGAN
Without obligation please rush complete information on the Cadillac PLA-CHEK Gage line to:

Name_____

Company_____

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City_____ Zone____ State_____

Cadillac
GAGE COMPANY
P. O. BOX 3806 • DETROIT 5, MICHIGAN

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FOR MACHINE TOOLS

Standardized set-up appliances

Why Force Your Men to waste time on machine tool set-ups when CAD Standardized Appliances will convert this non-productive time into productive labor?

Why Ruin Machine Table Slots with ordinary bolts when CAD Bolts are designed to fit T Slots?

The CAD Bolt is a standard machine table bolt, made of steel with full threads, *ready for use when you receive it.*

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STANDARD SHOP EQUIPMENT CO.
SET-UP APPLIANCES FOR MACHINE TOOLS
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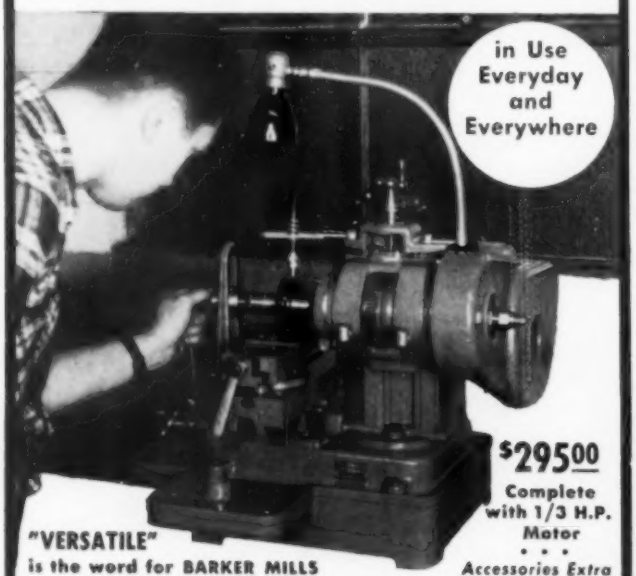
★ MORE BARKER MILLS in MORE PLANTS on MORE JOBS



$295.00 Complete with 1/3 H.P. Motor
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Tested Design and Unusual Operational Features are Boosting Barker's Popularity with machinists and plant executives by leaps and bounds. More than a thousand in use already in diversified industries and on various machining operations. Satisfaction that prompts repeat orders is one of our strongest claims. Investigate the BARKER before you buy. We know the BARKER MILL can work wonders in your tool room or on your production line.

Write for Details. **BARKER ENGINEERING CO.** 500 GREEN ROAD CLEVELAND 21, OHIO

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TO OBTAIN FURTHER INFORMATION ABOUT ADVERTISERS, TRADE LITERATURE OR TOOLS OF TODAY APPEARING IN THIS ISSUE OF THE TOOL ENGINEER, USE THE HANDY READERS SERVICE CARD ON PAGE 201

RUST-LICK

WATER SOLUBLE - NON-FLAMMABLE - RUST PREVENTIVE

FOR EFFECTIVE GRINDING OF CARBIDE TOOLS

The use of RUST-LICK "B" and water will increase DIAMOND WHEEL life—eliminate fire hazards, rancidity, dermatitis and rust.

Currently used by leading manufacturers of Carbide Tools.

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"Why is it easy to plan Hydraulic Circuits using RIVETT VALVES?"

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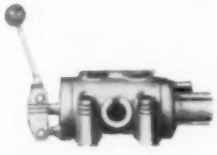

Hand, Foot, Cam, Solenoid, Pilot Operated

Sub-Plate Mounted, Solenoid, Pilot Operated

Flow Control, Check, Deceleration, Relief, Unloading, Sequence, Counter-Balance

1500-3000 P.S.I. | PISTON DESIGNS FOR ANY CIRCUIT

Sizes: 1/4", 3/8", 1/2", 3/4", 1", 1-1/4", 1-1/2"

Actions: Standard, Spring Return, Spring Centered, Ball Detent

"1st — Rivett's 190 standard models give me more latitude in engineering a circuit. This wide selection permits choosing the right type of valve for a more economical and efficient operation."

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"2nd — My Rivett Distributor is experienced in hydraulic design. With his help I have been able to plan better operating systems."

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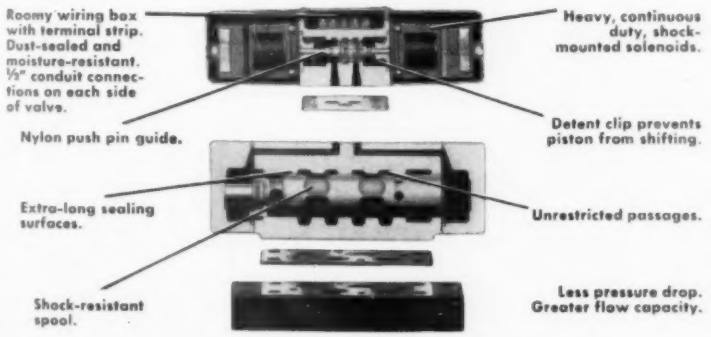
Roomy wiring box with terminal strip. Dust-sealed and moisture-resistant. ½" conduit connections on each side of valve.
Heavy, continuous duty, shock-mounted solenoids.
Nylon push pin guide.
Detent clip prevents piston from shifting.
Extra-long sealing surfaces.
Unrestricted passages.
Shock-resistant spool.
Less pressure drop. Greater flow capacity.

Sub-Plate Mounted, Solenoid, Pilot Operated Valve

"3rd — I can count on longer life as well as the rated performance of Rivett Valves. They are designed and built for accurate circuit control."

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"4th — Rivett valve catalogs are complete with specifications and drawings. Write for #204 and #260."

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RIVETT furnishes a complete power package

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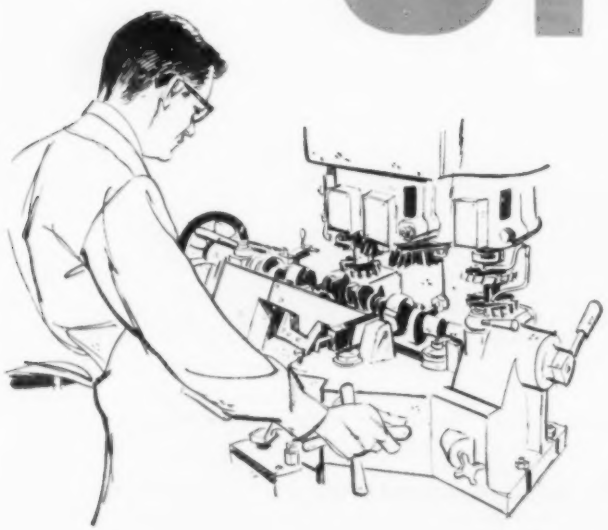

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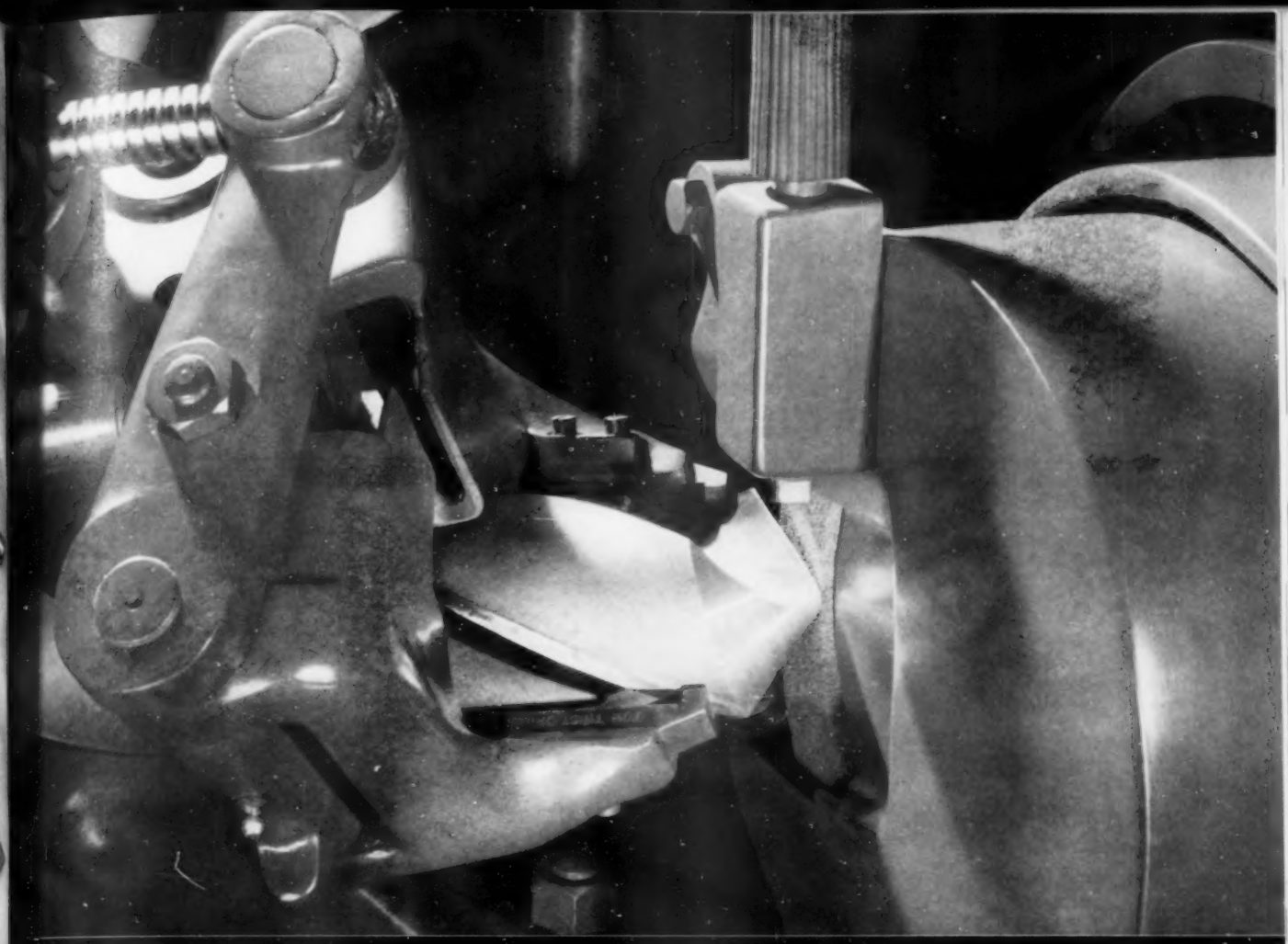

Every drill you grind on a
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cuts exactly like a new one!

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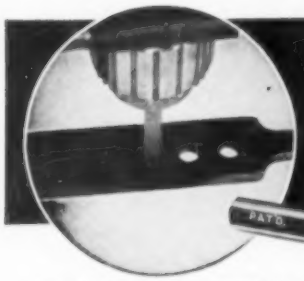

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"HARDSTEEL" Drills fit standard drill presses. They save time and reduce rejects. They permit engineering changes requiring additional drilling after hardening. And parts drilled after hardening always match at assembly.

Write for a copy of the "HARDSTEEL" Operators Manual showing how "HARDSTEEL" drills are cutting costs in thousands of plants.

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Also makers of— BLACK DRILLING UNITS—AUTOMATIC, SELF-CONTAINED—FOR COST-CUTTING PRODUCTION ON ALL MATERIALS *Write for information*

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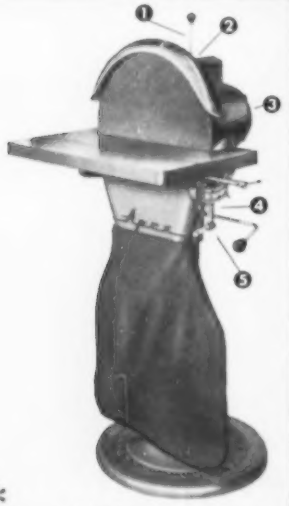
NEW Apex DISC GRINDER $247*



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5. **SQUARING PIN** Table can be accurately set at any degree, from 45° up or down, is automatically squared when returned to normal position.

* $247 covers model 15-S grinder complete with ½ HP, 3 PH. motor, F.O.B. Los Angeles.

Dealer inquiries invited. Write for illustrated brochure and price sheet.

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IN CANADA—MATTHEW MOODY & SONS LTD.

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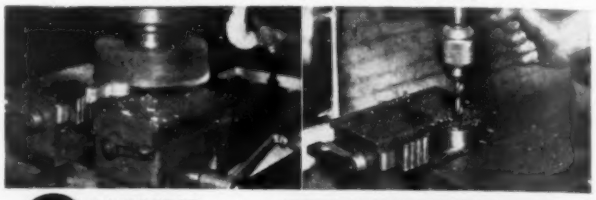
"FLEXIBLE JAWS" GRIP *ANY* SHAPE!

Positive grip vise. Grips any irregular shape. Grips secure and positive for the most precise milling, drilling or cutting operation. Eliminate the time and expense of blocking and shimming irregular pieces for toolroom machining. Try it in your shop. Save time and dollars on small production runs. Write for complete information now.

APPLICABLE ON ANY MACHINE TOOL.



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SLIP-PROOF

STRONGEST CHUCK MADE

TRY ONE

K. O. LEE CO.
ABERDEEN, S. D.

If it's made by **Lee** *it's a* **"Knock-Out"**

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DYKEM STEEL BLUE

Stops Losses making Dies and Templates

Popular package is 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

Write for sample on company letterhead

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To help improve induction heating applications, Lindberg engineers have spent two years developing equipment for M-G set frequencies of 1 kc., 3 kc. and 10 kc. This equipment is now available to you.

This development has also produced many advanced design features that are incorporated in control and heating stations used in connection with motor generator equipment.

Generators are available in power outputs from 30 kw. to 1250 kw.

Lindberg engineers are now equipped to solve your metal heating problems using optimum frequencies for specific applications from 60 cycles upwards. For information consult your nearest Lindberg field office or write for Bulletin No. 1460.

The High Frequency Division of Lindberg Engineering Company announces a complete line of

MOTOR GENERATOR EQUIPMENT for all Induction Heating Applications

HIGH FREQUENCY DIVISION
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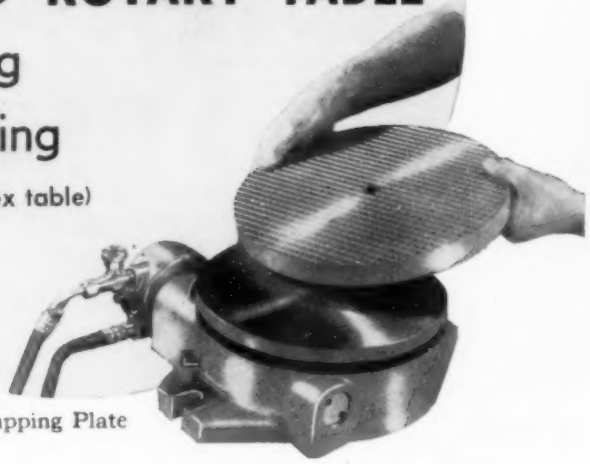
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-243

With Permanent Magnetic Chuck

NEW *Vulcan* MOTORIZED ROTARY TABLE

for lapping and grinding

(not an index table)



With Lapping Plate

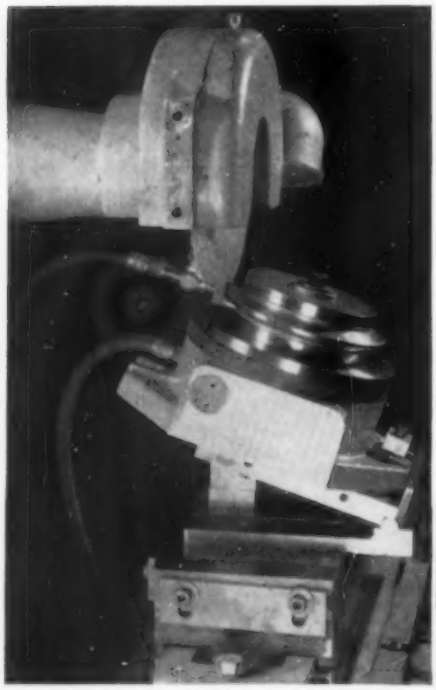
FASTER
circular precision grinding!

Now with this table and with less effort you assure highest standards of accuracy, flatness, finish and close tolerances. At the same time you eliminate slow and complicated tool setups. You cut grinding time greatly by using only cross feed while the table is rotating at infinite speeds between 40 and 100 RPM.

For example, Vulcan's Rotary Table can be used in connection with a sine plate or angle fixture. The dressing of large expensive external wheels for side grinding is therefore eliminated. If you wish we can provide permanent magnetic chucks designed for use with our table, both 6″ and 10″ in diameter.

Vulcan's Rotary Table is an air operated, self contained unit, portable between bench or machine. A precision center hole for locating and tapped holes in the table for clamping provides easy setup. Circular surface grinder applications are many and varied — grind flanged studs or bushings — bearing spacers — forming rolls — cutters — convex or concave surfaces — punches or dies (radius or angle).

Lapping? Yes — and in micro inches. For the 6″ and 10″ table, lapping plates of 12″ and 16″ are provided. Perfect for lapping valve plates, gages, bearing spacers and for carbide lapping using diamond powder. *Write for circular.*



Work clamped to motorized table, mounted on sine plate. Surface grinder application.

Major Vulcan Services

Engineering, Processing, Designing and Building . . . Special Tools . . . Dies . . . Special Machines . . . Vulcamatic Transfer Machines . . . Automation . . . including the Vulcan Hydraulics that Form, Pierce, Assemble and size. Vulcanaire Jig Grinders . . . Motorized Rotary Tables . . . Plastic Tooling.

VULCAN TOOL CO.

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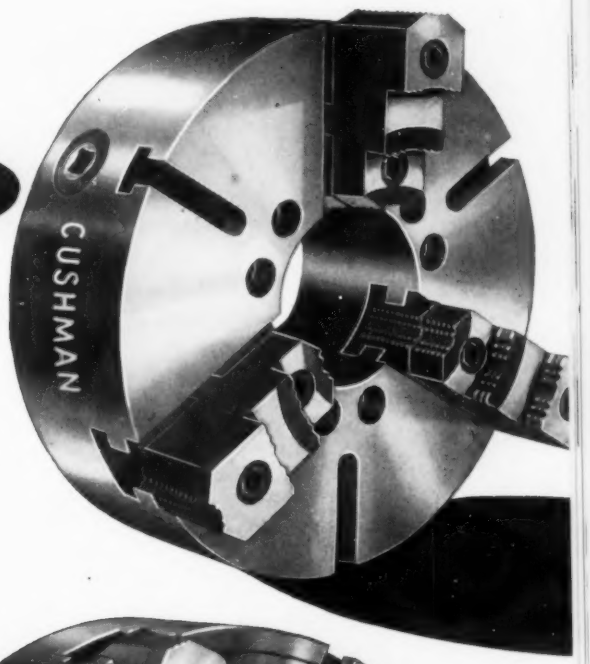
CUSHMAN chucks

give Chuck-ability

CHUCK-ABILITY — The ability to SPEED your work . . . ELIMINATE fatigue . . . IMPROVE your products . . . and REDUCE your costs . . . through design and selection of the right work-holding devices.

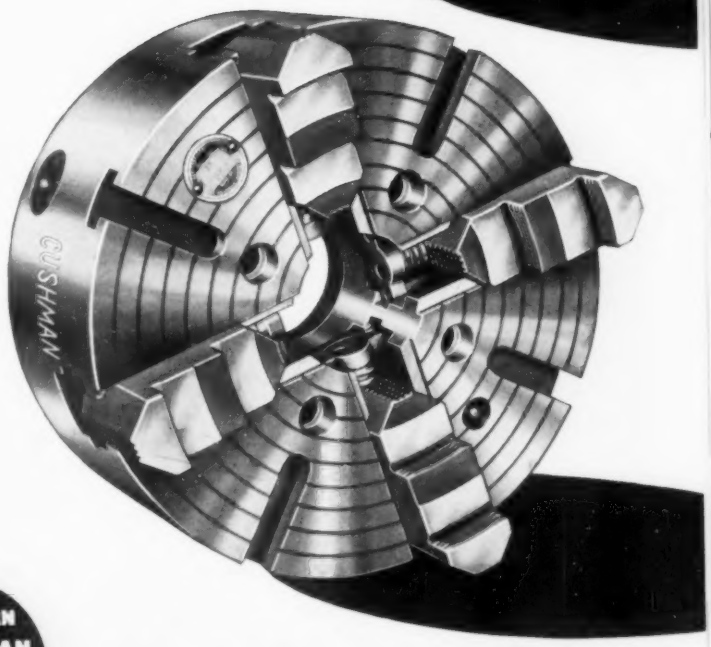
ical Manually Operated Cushman Chuck-ity Chucks designed for Engine, Tool n and Manufacturing Lathes:



the key to machining efficiency

If you don't hold it right, you can't machine it efficiently or economically . . . a positive truth for any chucking operation, whether it is the everyday simple routine job, or complex machining operations with many surfaces and close tolerances. Cushman Chucks give you **Chuck-ability** . . . the answer to efficient and economical machining of the new steels and alloys at high spindle speeds.

Chuck-ability is available to you in Cushman's complete line of manually and air operated precision chucks, an invaluable combination of Cushman's exceptionally broad engineering experience plus know-how of the leading chucking specialists. Write today for catalogs fully describing Cushman Chucks. Consult us on all of your work-holding problems . . . standard or special.



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Hartford 2, Connecticut
a world standard for precision

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a Product of American Quality, Labor and Materials

CUSHMAN the CHUCKMAN
CHUCKS AND ACCESSORIES Exclusively SINCE 1862

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manufacturers of:

Air Operated Chucks, Cylinders, and Accessory Equipment . . . The Cushman Power Wrench . . . Cushman Manually Operated Chucks and Face Plate Jaws.

Tough grinding jobs?

Check *Vulcanaire* high speed precision grinding heads!

Grinding circular slot using Vulcan's Rotary Table and Magnetic chuck.

Many seemingly impossible grinding problems have been solved by adapting Vulcanaire to standard machines or by using one of Vulcan's specially designed machines.

On Surface Grinders, merely remove wheel and guard, clamp vertical or horizontal adaptor to machine as illustrated. No belts necessary. For instance, Vulcanaire used in connection with Vulcan's Rotary Table for Surface Grinders permits the grinding of a circular slot.

Vertical adaptor for Surface Grinders. Grinding small slots

Adaptors are in stock to fit the spindle of Vertical Milling Machines for grinding contours, holes and slots.

On Internal Grinding Machines Vulcanaire's infinitely controlled speeds furnish the correct surface cutting speed resulting in faster production and micro finish. The adaptor sleeve fits into present housing.

Applied to Jig Boring Machines, Vulcanaire is liked by leading precision manufacturers because its accuracy is guaranteed, producing Vulcanaire jig grinding of large and small parts.

Horizontal application. Grinding a shoulder Punch.

Send us a blue print on your toughest grinding problem. Recommendations and sketches will be returned to you — no obligation.

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Engineering, Processing, Designing and Building... Special Tools... Dies ... Special Machines ... Vulcamatic Transfer Machines ... Automation ... including the Vulcan Hydraulics that Form, Pierce, Assemble and size. ... Vulcanaire Jig Grinders ... Motorized Rotary Tables ... Plastic Tooling.

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Here is a new performance-tested line . . . burs and rotary files, carbide or high-speed steel, shapes and sizes to meet every need. They're precision-made and proudly marked with the Golden-Circle, symbol of dependable ELGIN quality. Write for your copy of the "Golden-Circle" booklet today!
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. . . see how many operations can be made easier and faster. See how many shapes and sizes are made to meet your need.
ABRASIVES DIVISION, DEPT. S
ELGIN NATIONAL WATCH COMPANY
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New Adjustable-Arm *Air-Cooled* Dazors

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Industrial User Price: $6.19

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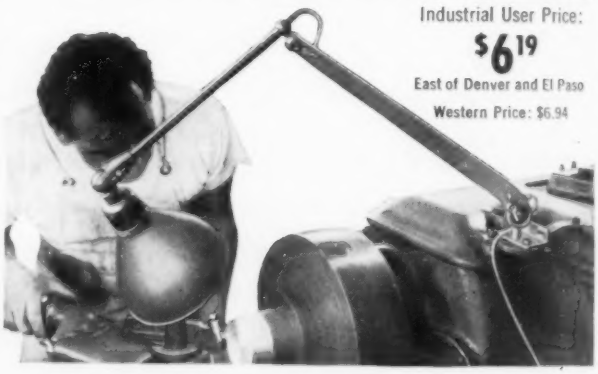
Western Price: $6.94



Get cool, efficient lighting with this new Dazor-quality fixture. Holds fast in any desired position, despite vibration or shock. Universal base. Top-mounted reflector shown above. Either 31" arm extension (No. 1100) or 20" (No. 1101). Gray baked enamel over bonderizing. Call your Dazor distributor. Dazor Manufacturing Corp., St. Louis 10, Missouri.

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DAZOR FLOATING LAMPS

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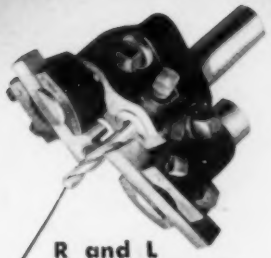
R AND L TOOLS

your combination . . .

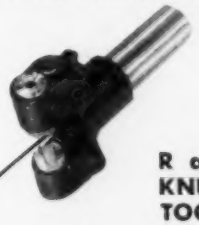
TO LOWER COSTS . . . GREATER PROFITS!

In this day and age of AUTOMATION set-up time is a prime cost factor. Cut your set-up time by as much as 75% with R and L TOOLS.



R and L TURNING TOOL . . .

changes in 10 seconds for right or left turning, and replaces an assortment of 14 tools costing more than five times that of one R and L Turning Tool.



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Half the weight . . . twice as efficient as other knurling tools. One hex wrench makes all adjustments.

R and L TAP AND DIE HOLDERS . . .

New release mechanism makes right or left threading possible . . . an exclusive R and L feature.

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Can be adjusted to operate on any internal diameter within capacity of machine . . . Newly designed!

R and L TOOLS are masterpieces of the toolmaker's art . . . guaranteed not to bend or give way. Thousands of users attest that they pay for themselves in no time!

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R and L TOOLS
1825 BRISTOL ST.
PHILADELPHIA 40, PA.

☐ Please send me your new catalog
☐ Please arrange for no-obligation demonstration of R and L TOOLS

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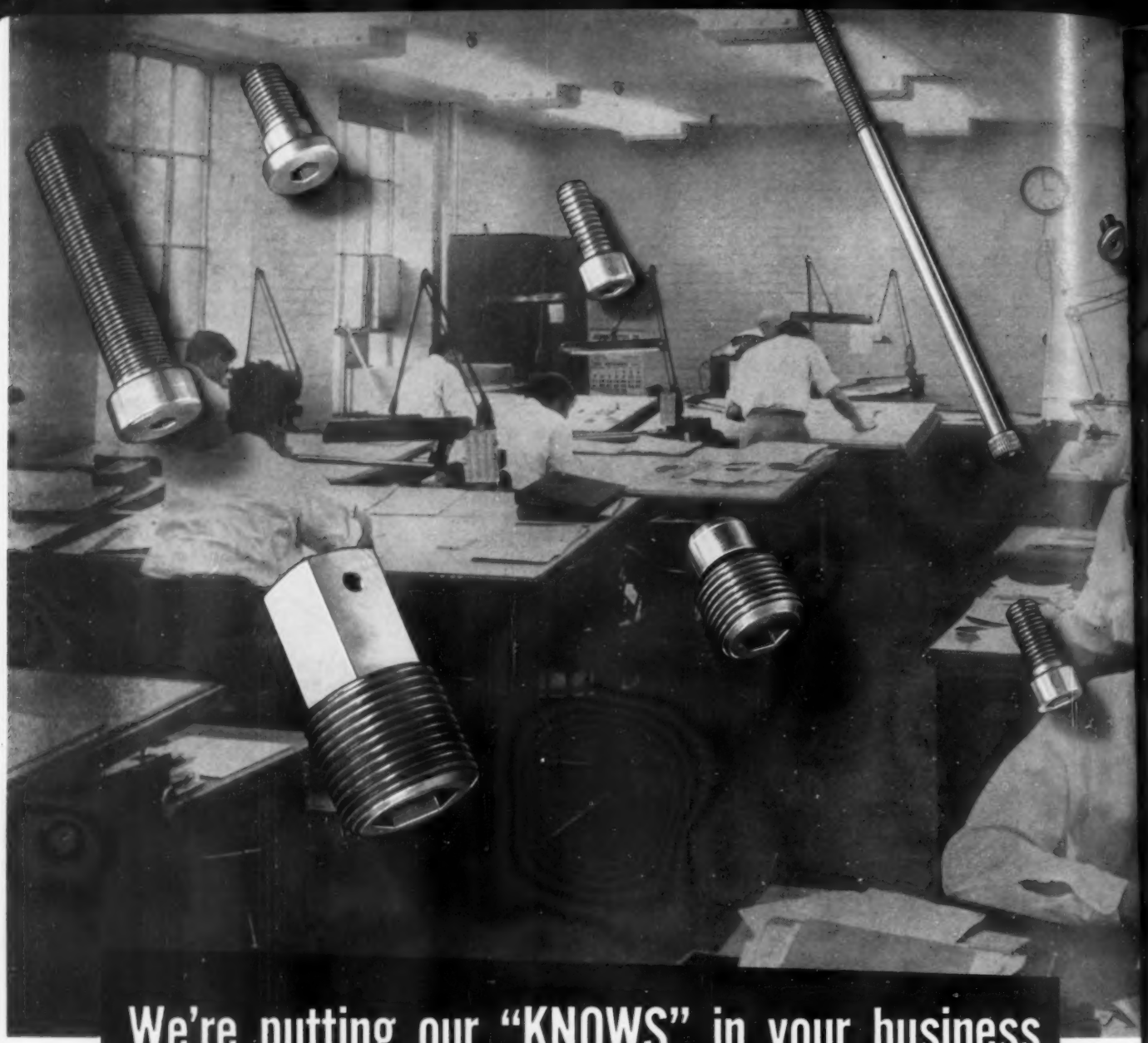

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Allen engineers solve a problem a day... for socket screw users

Allen has always been headquarters for socket screw know-how. Last year, Allen metallurgists, designers and engineers teamed up to handle over 360 technical problems for precision fastener users.

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ALLEN

MANUFACTURING COMPANY

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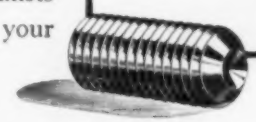
ALLEN HEAD



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Miller AIR AND HYDRAULIC CYLINDERS AND BOOSTERS "IN STOCK" for immediate delivery

See Miller Bulletins A-105K (Air) and H-104K (Hydraulic) for Complete Dimensions and Engineering Data on these "in-stock" sizes and other Custom Miller Cylinders in bores up to 20" and strokes up to 22 feet.

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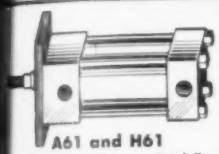
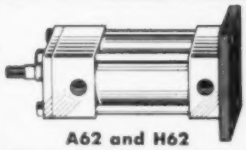
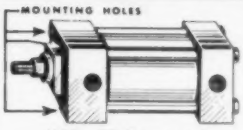
"A" Signifies Miller 200 psi Air Cylinders; "H", 2000 psi Hydraulic Cylinders. Interchangeable Mountings Are Shown In Red On Drawings.



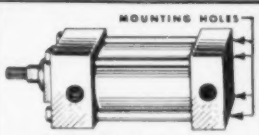
A61 and H61
Flange Mounting on Rod End



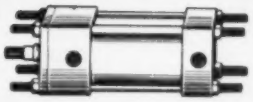
A62 and H62
Flange Mounting on Cap End



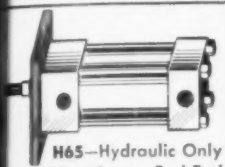
A63—8" Bore only
Flange Mounting on Rod End



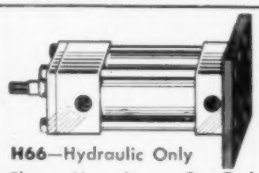
A64—8" Bore only
Flange Mounting on Cap End



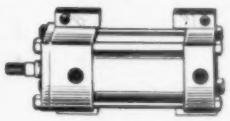
A50 & H50—Tie Rods not extended beyond nuts.
A51 & H51—Tie Rods extended both ends (shown).
A52 & H52—Tie Rods extended. Cap End only.
A53 & H53—Tie Rods Extended. Rod End only.
A54 & H54—Two Tie Rods extended at both ends.



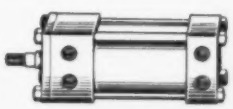
H65—Hydraulic Only
Flange Mounting on Rod End



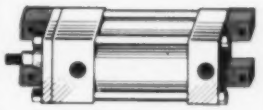
H66—Hydraulic Only
Flange Mounting on Cap End



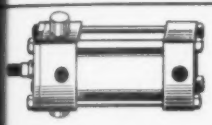
A72 and H72
Side Lug Mounting



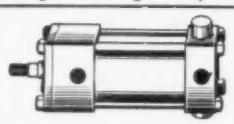
A74 and H74
Side Flush Mounting



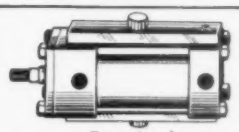
A77 and H77
Side or Foot Mounting



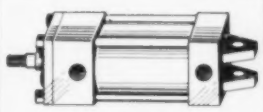
A81 and H81 Trunnion Mounting on Rod End



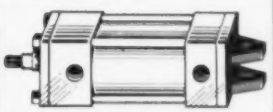
A82 and H82 Trunnion Mounting on Cap End



A83 and H83 Trunnion between Head and Cap (one week delivery)



A84 and H84
Pivot Mounting



A86 and H86
Pivot Mounting

"IN-STOCK" STROKES (in Inches)

IN STOCK BORES In Inches		BORES	ROD DIA.	ROD TURN DOWN & THREADS		1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
	AIR	1½	⅝"	7/16-20	Cushioned																						
					Non-Cush.	1	2	3	4	5	6																
		2	⅝"	7/16-20	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
					Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
		2½	⅝"	7/16-20	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
					Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
		3¼	1"	¾-16	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
					Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
		4	1"	¾-16	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
					Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
		5	1"	¾-16	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
					Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
		6	1⅜"	1-14	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
					Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
		8	1⅜"	1-14	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
					Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
	HYDRAULIC	1½	⅝"	7/16-20	Cushioned																						
					Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12										
		2	1"	¾-16	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
					Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
		2½	1"	¾-16	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
					Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
		3¼	1⅜"	1-14	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
					Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
		4	1¾"	1¼-12	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
					Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
		5	2"	1½-12	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	
					Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36	

(1) (4) (3) (2)

"A" and "H" Models 82, 84 and 86 with strokes over 18" require stop tubes.

Column strength requires larger diameter piston rods for the following:

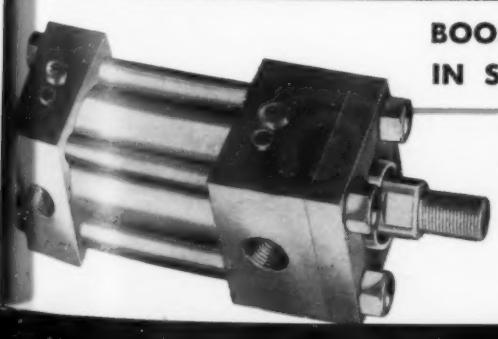
Air Cylinder Models A82, 84, and 86 with strokes inside area (1), when operated at 100 psi and over;

All hydraulic models with strokes inside area (2) and Models H82, 84, and 86 with strokes in area (4), when operated at 2000 psi and over;

Models H82, 84 and 86 with strokes inside area (3), when operated at 1000 psi and over.

Depending upon Trunnion Pin location, "A" and "H" Models 83 with standard diameter piston rods can have longer strokes than Models 82, 84 and 86.

See Miller File #251 for oversize piston rod and stop tube requirements.



BOOSTERS IN STOCK

Immediate Delivery on the following Miller 25 to 1 Ratio Boosters (80 psi air input produces 2000 psi hydraulic oil output): Model B4, 5" bore, 1" dia. ram, 6" and 12" strokes; Reciprocating Booster Model DA77-RBA8, 5" bore, 1" dia. ram, 6" stroke. Also Booster Tanks, 5" dia., 6" and 10" heights.

Write For Catalog and Stock Price List

Miller

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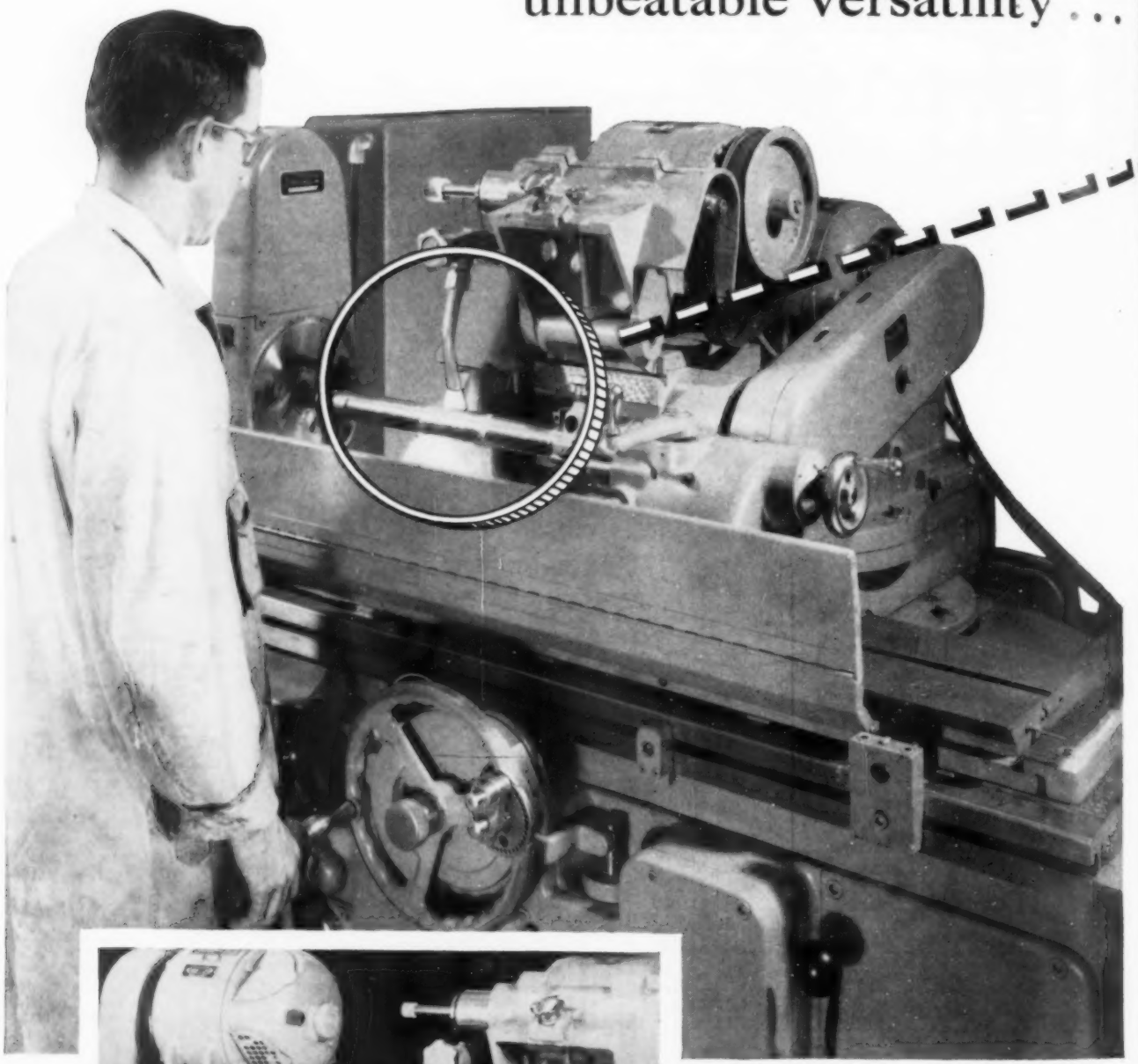
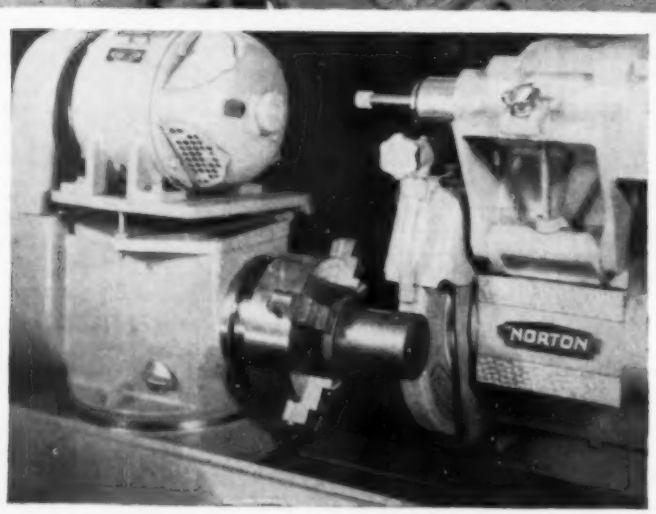
NEW Type U4 Norton Universal Grinders – 12″x 36″ and 12″x 48″ – feature unbeatable versatility . . .





Quick, Easy Set-Ups plus fast grinding action enable this new Norton 12″ grinder to cut time and costs in a wide variety of external, internal, face and angular wheel feed grinding jobs. Here the internal grinding spindle is shown swung up and out of the way while a shaft is being ground.

Permanent Chuck Mounting is an outstanding advantage. Headstock spindle has a dog drive plate on one end. On the other is a 5″ D-1 cam lock nose, on which you can leave a chuck mounted permanently — merely swiveling headstock 180° to start chucking jobs faster.

do more jobs ... save more $$$

Greatly simplified set-ups give you more time for grinding

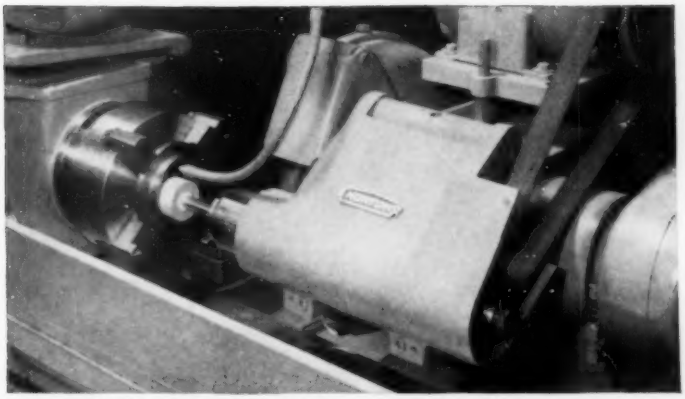
Double-barreled good news! The new Norton universal grinders are made in 12″ x 36″ and 12″ x 48″ work capacities!

Versatility keynotes the design, with feature after feature increasing the job range and cutting operating costs. For example, take the work speed range of 40 to 400 r.p.m. You get an infinite number of speeds over this wide range, simply by turning a dial.

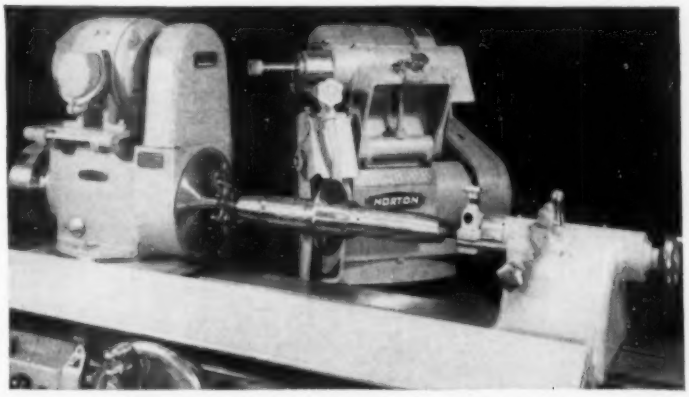
Other important features are illustrated here. It will pay you to look them over carefully — and consider their advantages in your own production.

Get the whole story

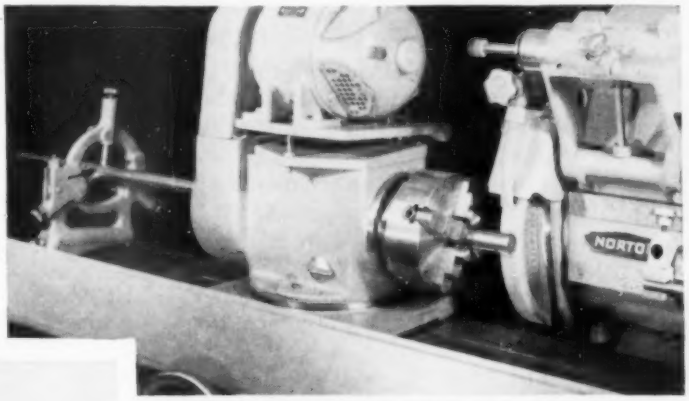
on the broad operational scope and fast, precision performance of these new Norton 12″ grinders. See your Norton Representative, or write us direct. And remember: only Norton offers you such long experience in both grinding wheels and machines to help you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Mass. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.



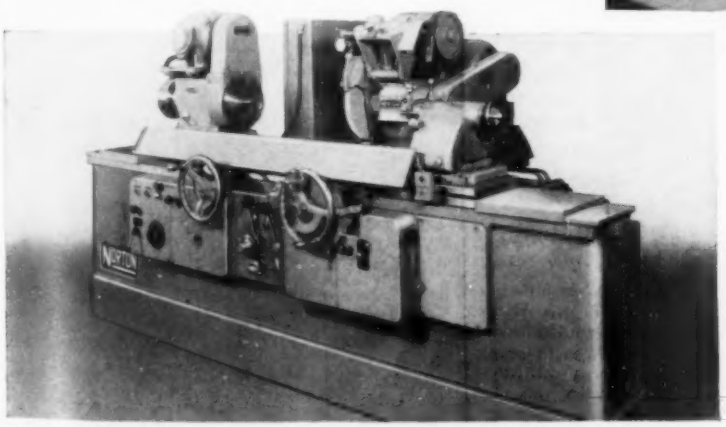
For Quick Change-Over to or from internal grinding, the internal grinding spindle is permanently hinged to front of wheel slide. This also enables you to perform both internal and external grinding on a single workpiece without changing the set-up.



Settings At Any Angle are possible for both wheel and feed, independently, with this compound wheel head slide. Wheel head has swivels above and below the slide ways; upper wheel head member can be positioned to extend capacity when wheel head is swiveled.



Greater Shaft-Grinding Capacity is assured by the hollow spindle in the headstock. A 1¼″ hole clear through the headstock spindle permits passage of shafts that may be longer than the machine — another typical advancement that means greater versatility and usefulness.



Advanced Design includes combined lever and handwheel operated footstock, electrical controls grouped in raised cabinet, pumps and motors easily accessible, table-ways pressure-lubricated from outside reservoir, ramped outlet from coolant tank to assist clean-out.

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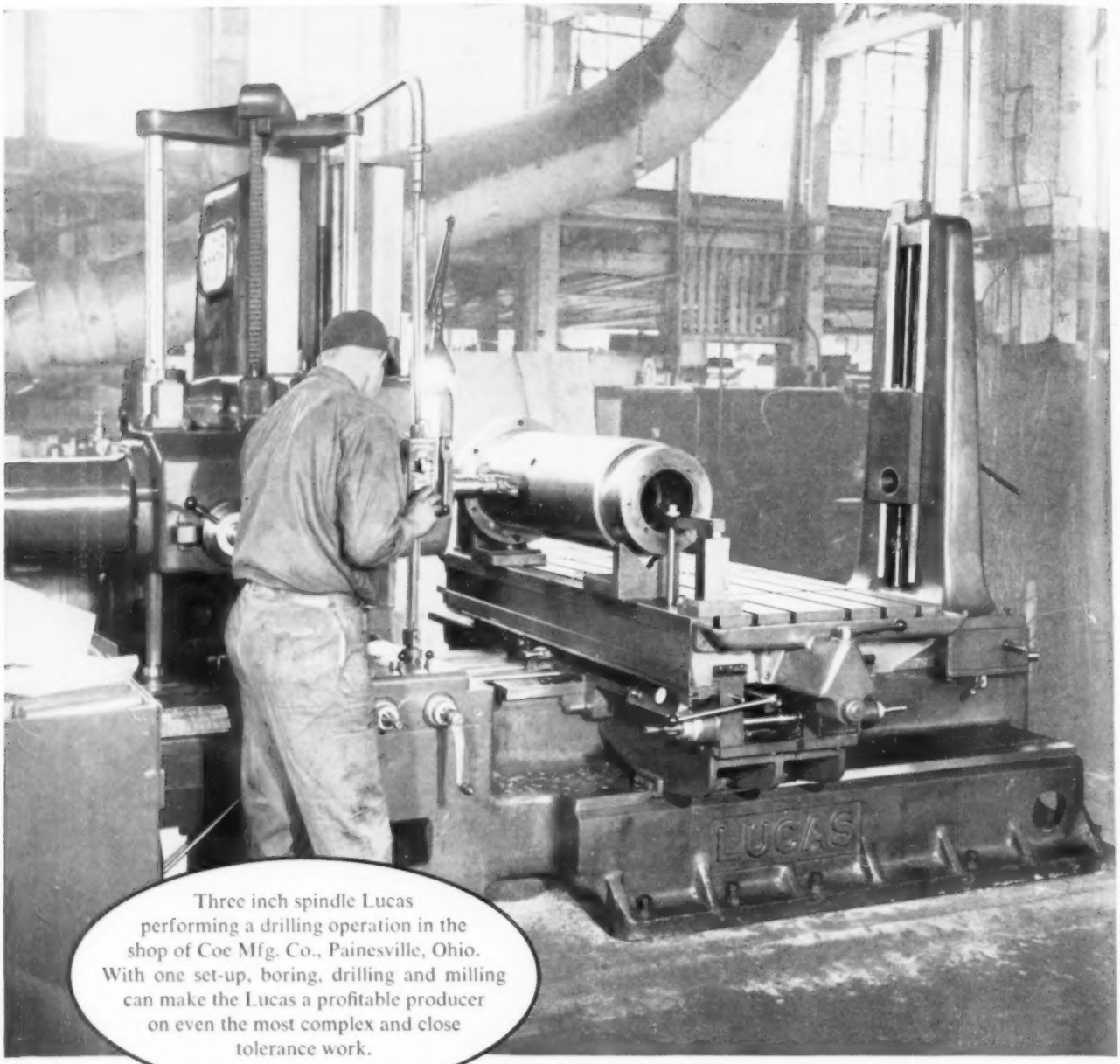

Three inch spindle Lucas performing a drilling operation in the shop of Coe Mfg. Co., Painesville, Ohio. With one set-up, boring, drilling and milling can make the Lucas a profitable producer on even the most complex and close tolerance work.

If you operate a contract shop, JUST ONE LUCAS will enable you to out-bid competition on a wide variety of work.

It will prove to be your most versatile and PROFITABLE machine — on one piece or a thousand — because it can perform a wider variety of operations than is possible on any other machine in your shop.

On many contracts your new Lucas will cut a big slice out of your COST DOLLAR and add substantially to your PROFIT DOLLAR.

A moderate investment will put this smaller size 3″ spindle, table type Horizontal Boring Machine to work making money for you.

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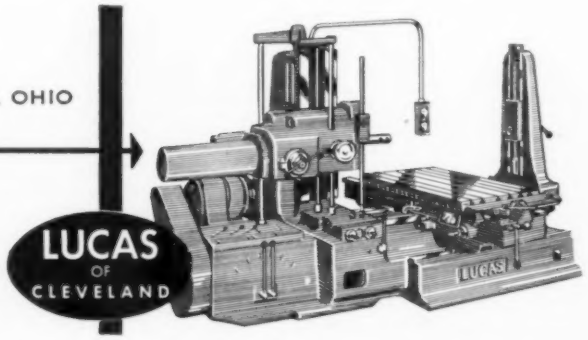
LUCAS MACHINE DIVISION

THE NEW BRITAIN MACHINE COMPANY • CLEVELAND 8, OHIO

. . . Machines for Making Progress

Three, four, five and six inch spindle
Lucas Horizontal Boring, Drilling and Milling Machines

Our general catalog is filed in the Sweet's Machine Tool Catalog File.



FOR FURTHER INFORMATION, USE READER SERVICE CARD: INDICATE A-4-252

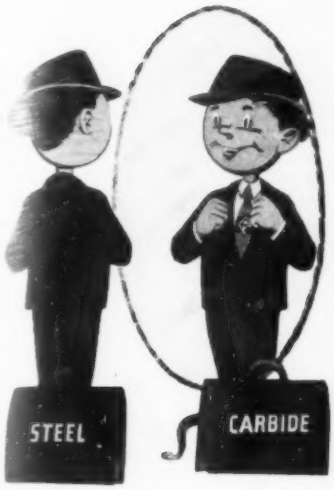


Photo shows automatic bolt maker. Courtesy of Oliver Iron & Steel Corporation.

Mr. Tooley Says:

"It takes two to make a bargain"

How right!

In the field of tools and tooling materials for shaping, forming and removal of metal, Firth Sterling occupies the unique position of supplying *both* steels and carbides to do your job. Thus you *are* always assured of a *bargain* . . . the just-right selection from alternative materials, offered *without bias* from a single source of complete shop tooling.

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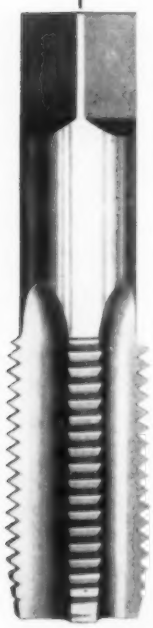

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CUTS COSTS 3 WAYS

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3 SAVES ON MAINTENANCE . . . The 912 is massively built to stand the shocks of constant use and is designed for quick, easy servicing and parts replacement.

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Branch Factory: Tyrone, Pa.

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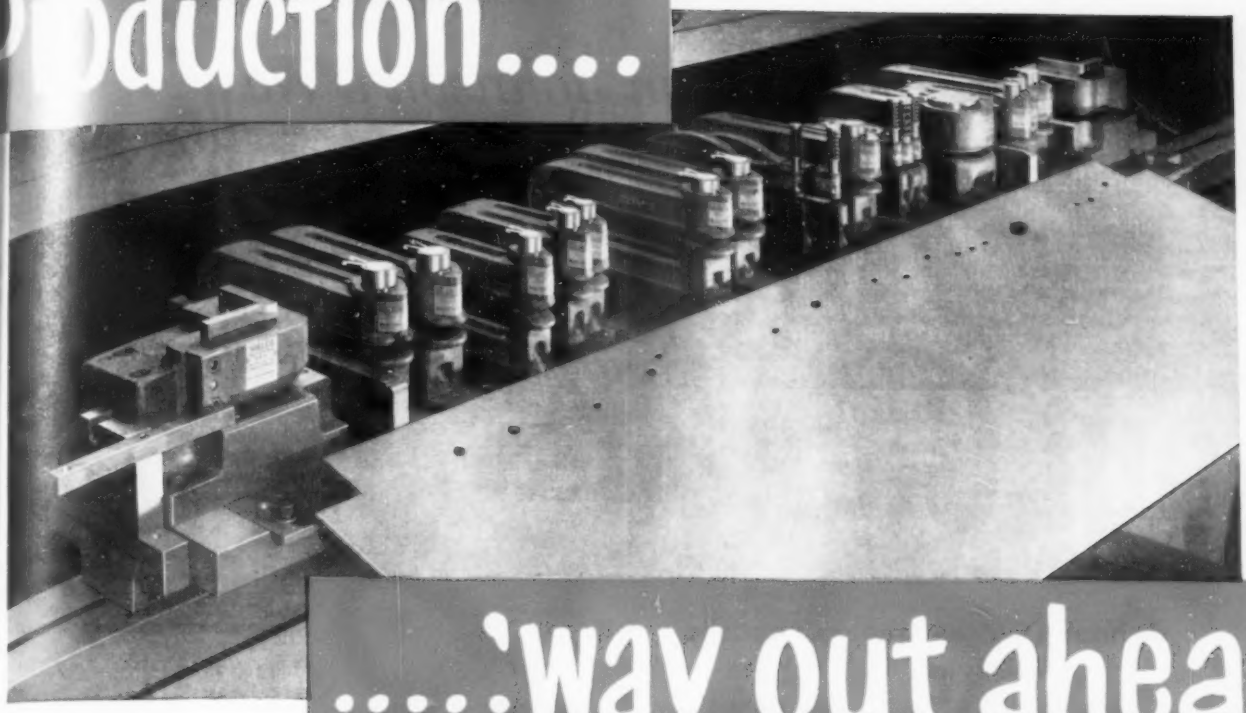
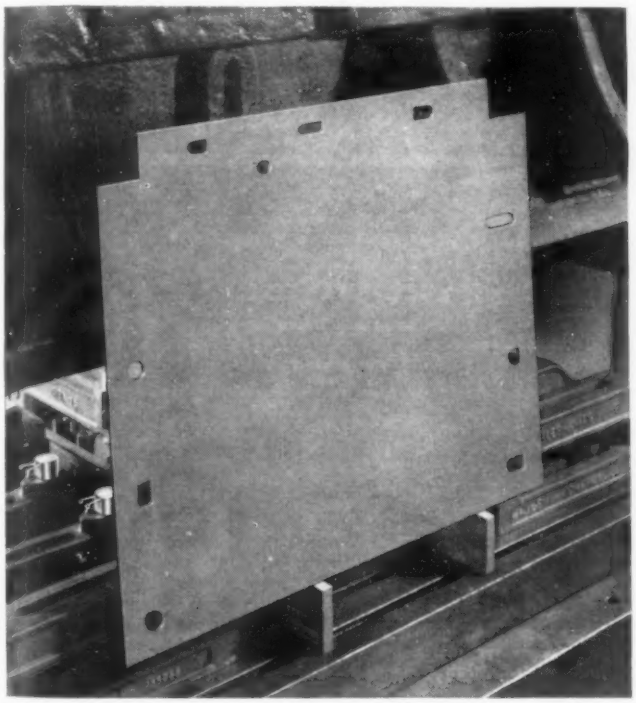
Production.....



.....'way out ahead

WALES HOLE PUNCHING & NOTCHING EQUIPMENT



TOP — Wales Type "BL" Hole Punching Units and Wales Type "N" Notching Units in a combination staggered hole punching and notching set-up in a press brake.

BOTTOM — Typical round and shaped holes plus corner notches produced by Wales Type "BL" Hole Punching Units and Type "N" Notching Units in a stamping press.

By providing simpler, faster set-up methods, Wales Hole Punching and Notching Units *insure greater production economies.*

For example, a group of these independent, self-contained Wales Units may be set up for punching and notching to produce parts the same day a pattern is released for production. These "Right-Into-Production" advantages are made possible by proven Wales features:

- Nothing attached to press ram
- Punches and dies always in perfect alignment
- No die set required
- Independent and self-contained
- Set up in press brakes and stamping presses on templates, T-slotted plates or press brake rails
- Uniform shut height requires only one ram adjustment
- Units may be used in unlimited set-ups eliminating "dead storage"

Before putting holes and notches in angles, channels, extrusions and sheets by *any* method, have the Wales facts at your finger tips. Write today for your personal copy of Wales BL catalog.

WALES-STRIPPIT CORPORATION

George F. Wales, Chairman

393 Payne Avenue, North Tonawanda, N. Y.

(Between Buffalo and Niagara Falls)

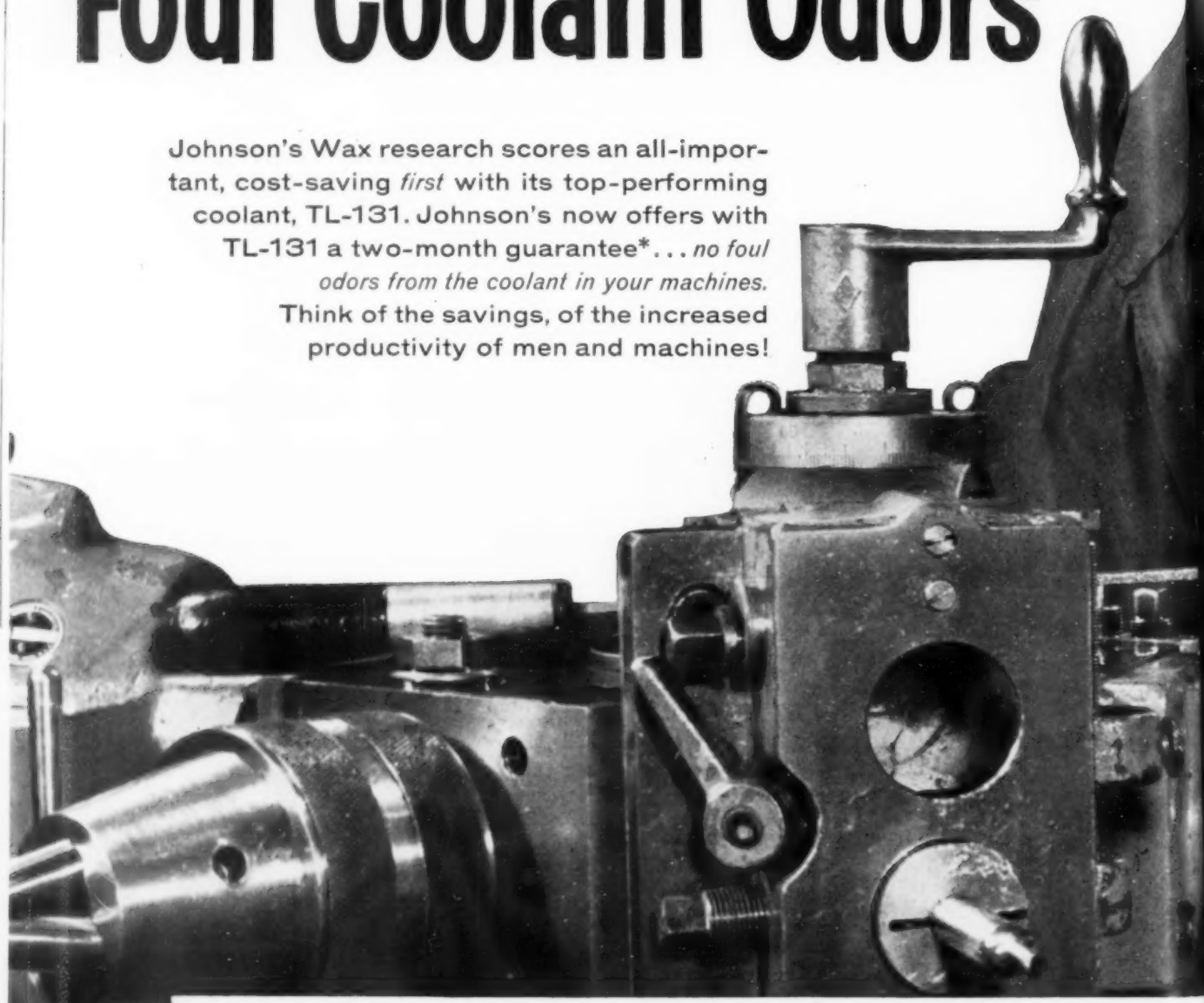
Wales-Strippit of Canada, Ltd., Hamilton, Ontario

Specialists in Punching and Notching Equipment

Here's great news from Johnson's Wax

TL-131 Stops Foul Coolant Odors

Johnson's Wax research scores an all-important, cost-saving *first* with its top-performing coolant, TL-131. Johnson's now offers with TL-131 a two-month guarantee*... *no foul odors from the coolant in your machines.* Think of the savings, of the increased productivity of men and machines!

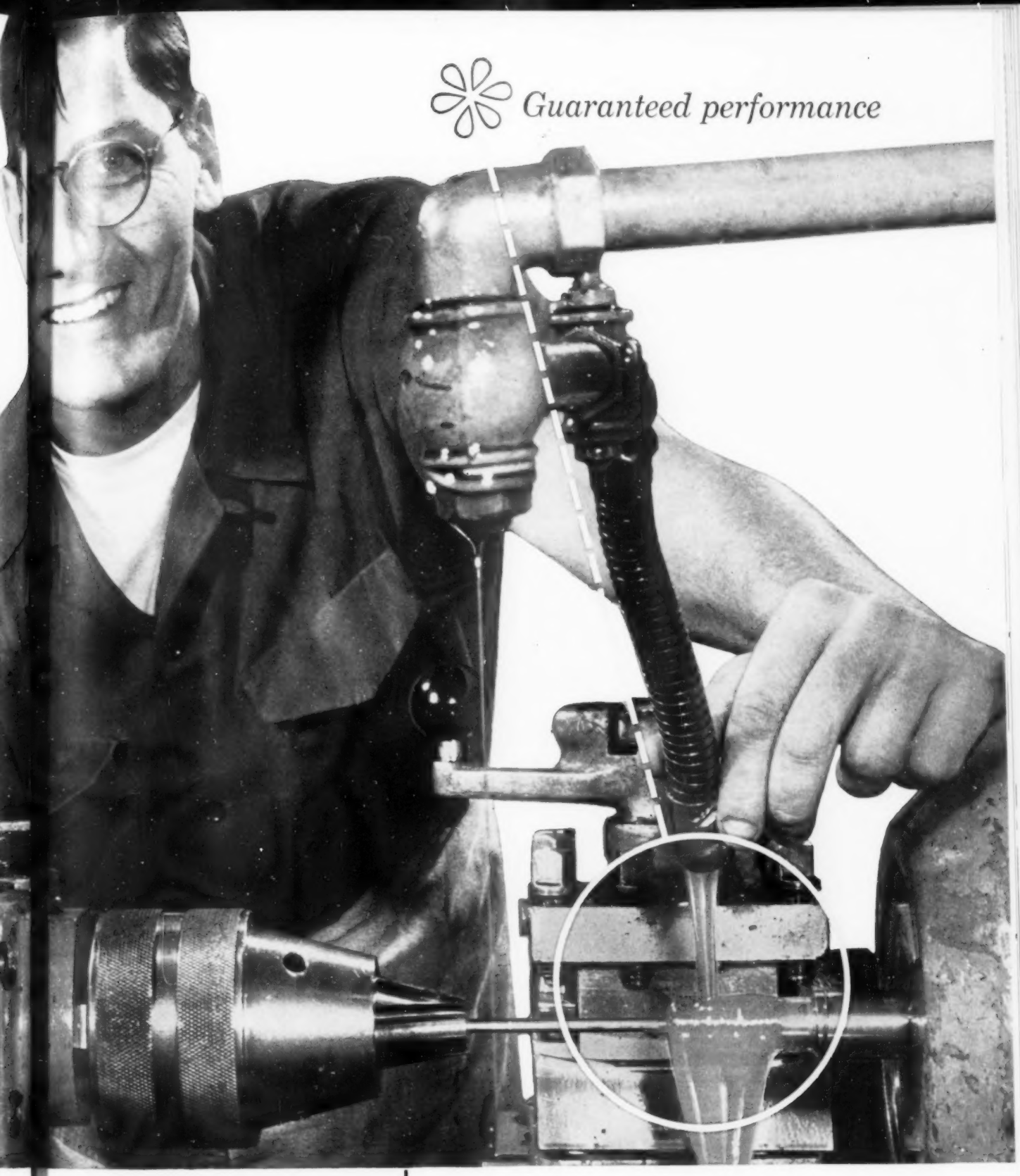


Your money back if **TL-131** causes coolant odors

There's hot, humid weather ahead, bringing with it the headaches of coolants that turn sour and create offensive odors. Combating coolant odors is time-consuming and costly . . . changing coolants every week or two . . . using irritating bactericides.

Now, Johnson's Wax announces that TL-131 is guaranteed to solve the problem of foul coolant odors. Simply clean your coolant system thoroughly, charge with fresh, clean TL-131 (economically diluted 40 to 1 with water), and w *guarantee* TL-131 will work efficiently for tw full months without causing foul odors.

In addition, TL-131 consistently outperform ordinary coolants to provide increased tool li and greater production. Remember, TL-131 the coolant that reduces work heat by .00°F See your local distributor for an in-the-sho test. Mail the coupon for full information.



Guaranteed performance

Mail this coupon today for FREE informative booklet on how to end foul coolant odors with TL-131.

A PRODUCT OF JOHNSON'S WAX

S. C. JOHNSON & SON, INC.
Industrial Products Division, Dept. TE-4
Racine, Wisconsin

Please send me your informative booklet on TL-131 Coolant.

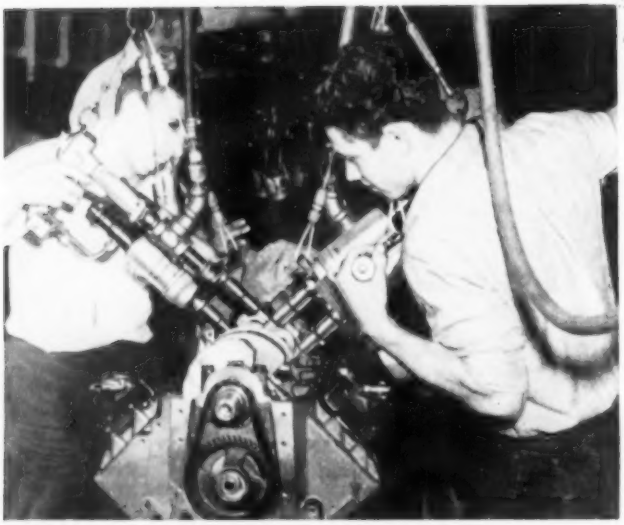
Name _____

Firm Name _____

Address _____

City _____ Zone ____ State _____

Multiple Spindles provide Greater Output!



2-Spindle Multiples tighten connecting rod bolts on the assembly line.

A 6-spindle Multiple Nut Setter assembles automobile crankshaft to flywheel.

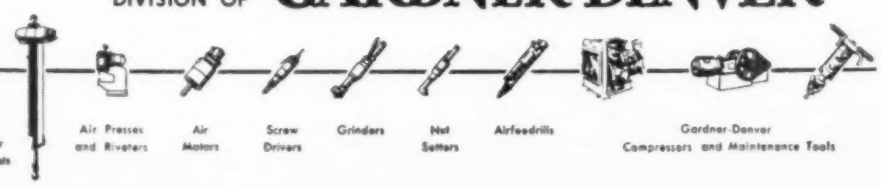
The new Keller Multiple Nut Setters improve quality control and reduce production costs. Manufacturers have been quick to make use of their advantages:

1. Built-in torque regulation in each individual spindle, giving control of torque on each bolt. Torque is adjustable from 4 to 190 ft/lb.
2. Torque held within close tolerances—comparable to that obtainable with accurate hand tools.
3. Increased production and lower production costs.
4. Easily adaptable to changing needs . . . a change in bolt spacing merely requires a new mounting plate for the spindles . . . when a job is completed the spindles are completely salvageable for use in another Multiple.

Do you have applications where bolts or nuts can be run and tightened two or more at a time? If so, it will pay you to investigate this remarkable tool. Write for Bulletin 16-101.

KELLER TOOL

DIVISION OF **GARDNER-DENVER**

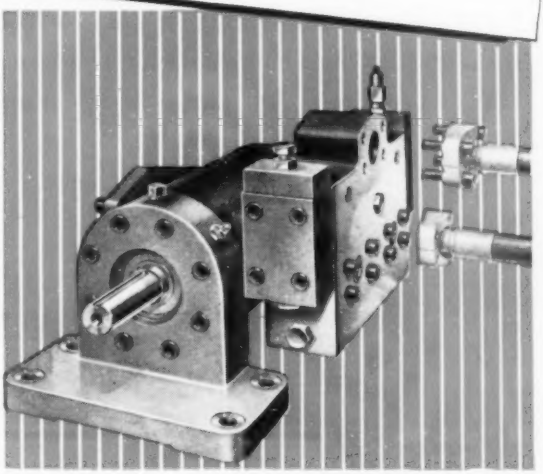


KELLER TOOL COMPANY
1311 Fulton Street
Grand Haven, Michigan

PUMPS 2000 PSI
PUMPS 5000 PSI
PUMPS/VALVES
MOTORS
ENGINEERING

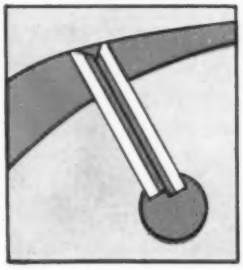
Mr. Tool Engineer:

We suggest that you'll want to be familiar with these important developments in Fluid Power . . . Products of The New York Air Brake Company!



DUDCO DOUBLE PUMPS WITH VALVE PANELS 2000 psi

These integral units meet the broad demands of circuits which call for substantial variations in pump volume, such as: "close and hold" or "traverse and feed" cycles. Hydraulic Presses, Plastic Molding Machines and many Machine Tools find these units highly efficient in operation, low in first cost, dollar-saving in reduced piping and valving in the circuit and supremely simple to service. Can be used in the operation of two separate systems or for Hi-Lo circuits.

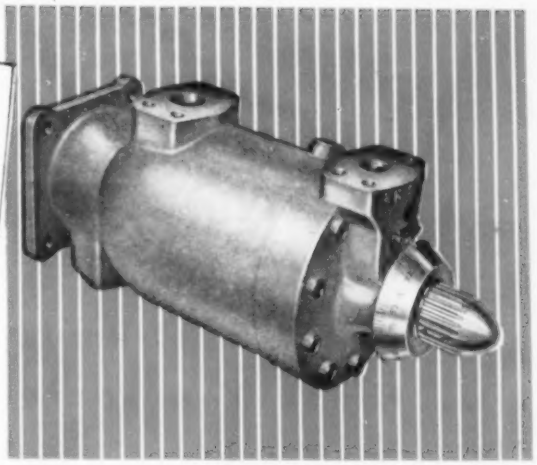


TWO VANES ARE BETTER THAN ONE

The hydraulically balanced DUAL-VANES, in DUDCO Fluid Motors, as contrasted with conventional designs, maintain MULTIPLE AREAS OF CONTACT ON THE CAM RING . . . doubling the number of effective barriers to slippage and power loss. This patented principle is an exclusive DUDCO feature!

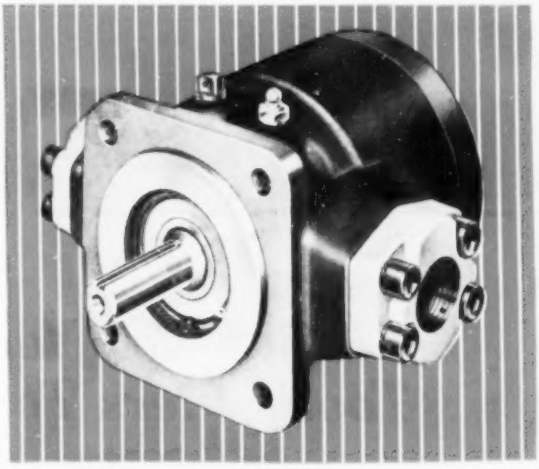
Bring your Hydraulics Data up-to-date . . . Write for your FREE Bulletins on DUDCO Pumps and Motors TODAY!

DUDCO DIVISION
THE NEW YORK AIR BRAKE COMPANY
1796 EAST NINE MILE ROAD • HAZEL PARK • MICH.
INTERNATIONAL SALES OFFICE, 90 WEST ST., NEW YORK 6, N. Y.



DUDCO VARIABLE DELIVERY PISTON PUMPS 5000 psi

The PV-600 Variable Delivery Pumps give designers a source of Fluid Power that is modern, compact, flexible, efficient and economical. These pumps are offered with two types of Variable Delivery Control. The handwheel Control provides accurate manual adjustment of delivery from zero flow to full flow. The Pressure Compensated Type features automatic pressure and flow control . . . delivery is reduced as pressure in the system reaches a pre-fixed maximum. Delivers 3 gpm at 5000 psi at 1200 rpm.



DUDCO DUAL-VANE HYDRAULIC PUMPS 2000 psi

Featuring a simplified, 3-unit construction, these DUDCO PF-100 Pumps provide designers with "a High Pressure Pump at a Low Pressure Price". The fully balanced DUAL-VANE construction assures high efficiency at higher pressures with wear reduced to an absolute minimum. Interchangeable Cam Rings add a factor of flexibility that conserves time and money. Available in flange and foot-mounted models, 3 to 11 gpm at 1200 rpm . . . 2000 psi. Other models delivering up to 120 gpm.

DUDCO DIVISION
THE NEW YORK AIR BRAKE CO.
1796 East Nine Mile Road
Hazel Park, Michigan
Gentlemen:
Kindly send me catalog information on
DUDCO 2000 psi Pumps ☐ 5000 psi Pumps ☐ Motors ☐
Pumps and Valve Panels ☐

Name_____
Address_____
City_____ Zone____ State_____

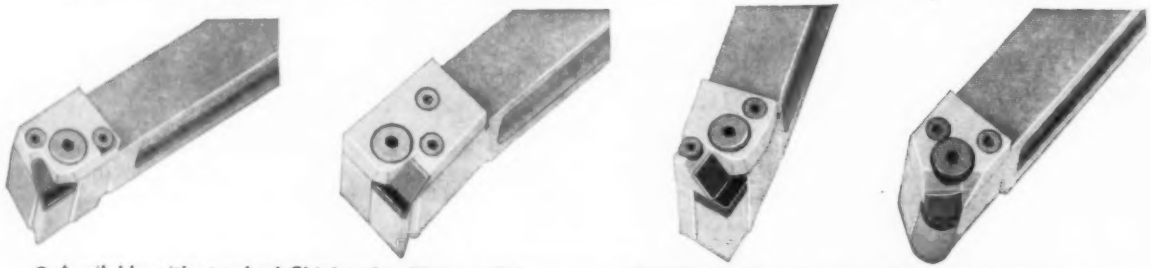
NEW LOW TOOLHOLDER PRICES ANNOUNCED BY VASCOLOY-RAMET

Sensational Demand Lowers Production Costs ...Gives You savings up to 44%!!!

Widespread acceptance of the New V-R Toolholder has made possible manufacturing economies in the production of these New Toolholders. These production savings are now being passed on to the user, resulting in price reductions of $7.50 to $10.00 (depending on size) for Toolholders using New "Throw-Away" inserts and reductions of $7.50 on Toolholders for 1½" long inserts. These New lower prices of V-R Toolholders plus the economies of "Throw-Away" inserts makes possible outstanding savings in carbide machining.

Only V-R Offers This Wide Range of Toolholders To Fit Every Application!

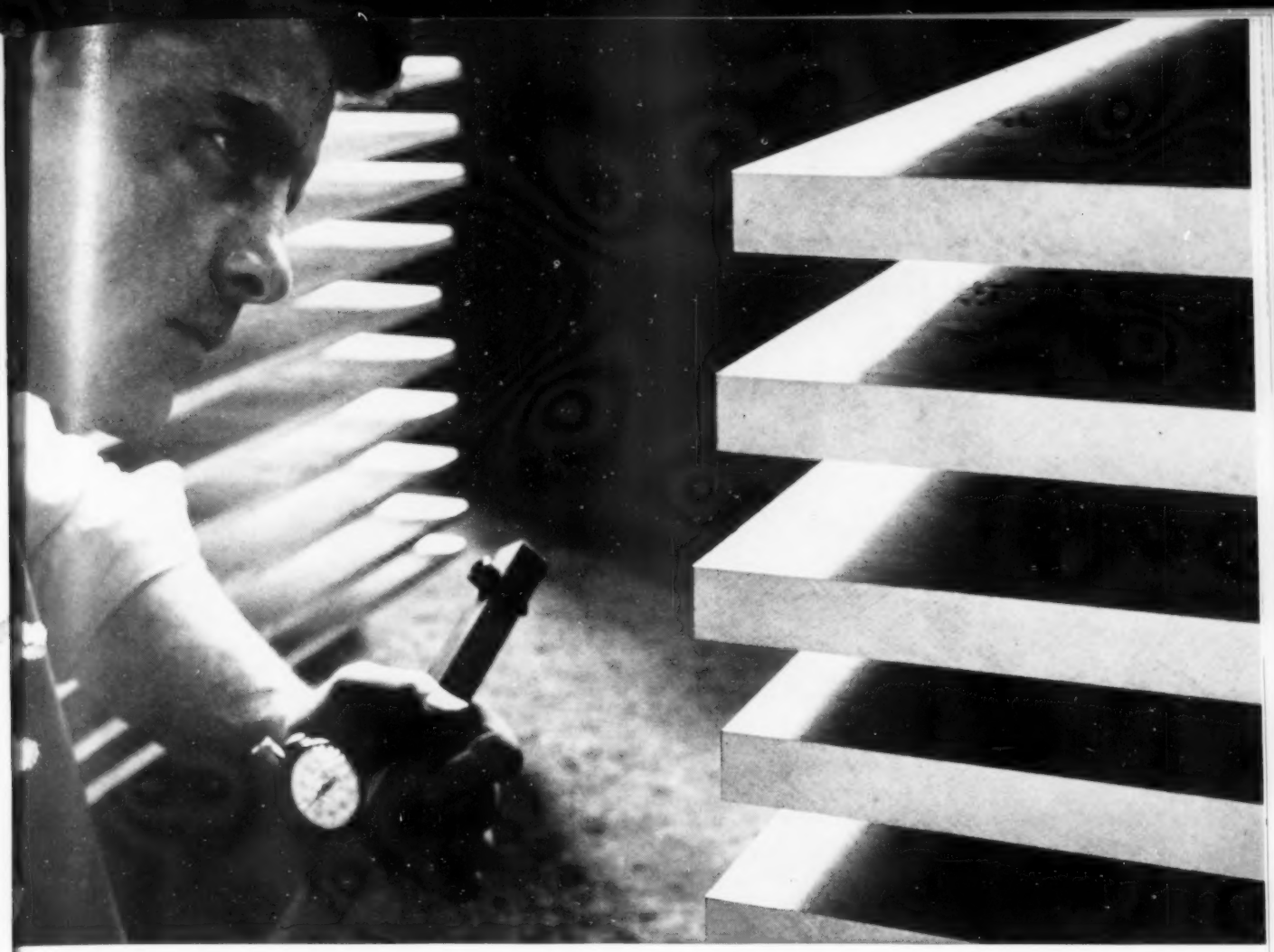
for Triangular . . . Square . . . Round Inserts
for Full Length . . . "Half-Length" . . . "Throw-Away" Inserts



- Available with standard Chipbreaker Plate or Chipbreaker Plate that can be modified for your specific job.
- Eliminates grinding Chipbreakers in Insert.
- One Toolholder for either Heavy Roughing Cuts or Light Finishing Cuts.
- Available in right hand or left hand styles.

WRITE TODAY FOR NEW PRICE LIST AND CATALOG OF COMPLETE LINE OF V-R TOOLHOLDERS

VASCOLOY-RAMET CORPORATION
826 MARKET STREET WAUKEGAN, ILLINOIS



big news in tooling plate is Dow Magnesium!

It's light in weight, the price is low, machinability is unsurpassed . . . magnesium opens a new door to low-cost tooling for you

Dow's new magnesium tooling plate is now available from Dow distributors across the country. This is the lightest tooling plate ever made—a full third lighter than aluminum and one-fourth the weight of steel. Yet you'll find its price lower than other commonly used tooling materials.

Dow magnesium tooling plate is rolled—not cast—providing larger sizes, freedom from porosity, better toughness, and a smooth mill surface. Thermal flattening assures positive dimensional stability and excellent flatness. Easiest of all metals to machine, magnesium permits speed and economy unequalled by other metals.

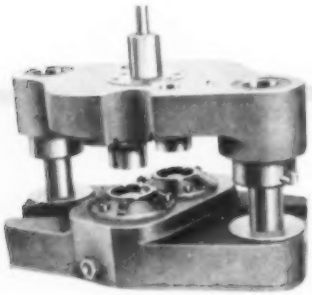
Extra rigidity, good weldability and high strength-to-weight ratio, too, make magnesium plate ideal for jig, fixture and tooling uses. Call your Dow magnesium distributor, today, for price and delivery data, or write THE DOW CHEMICAL COMPANY, Midland, Michigan.

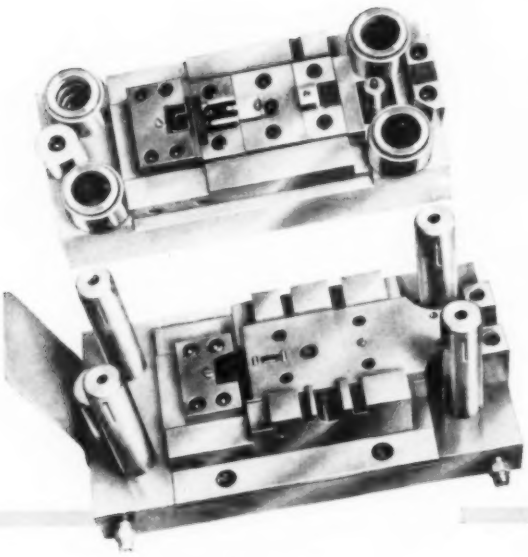
DISTRIBUTORS: FULLERTON STEEL AND WIRE COMPANY, Chicago, Ill. • HUBBELL METALS INC., St. Louis, Mo. • A. R. PURDY CO., INC., Lyndhurst, N. J. • RELIANCE STEEL COMPANY, Los Angeles, Cal.

you can depend on DOW MAGNESIUM

DOW

The die shown below is used at the Armstrong Cork Company for blanking and drawing screw bottle caps. Equipped with Carboloy cemented carbide, it operates accurately for months on material .006" thick. Steel dies had to be changed once a week.





Production increased 7,000 pieces per hour, tool maintenance cost dropped two thirds, when Carboloy cemented carbide parts were installed on all four stations of this progressive die set (above). It is used in producing SPEED NUTS® at Tinnerman Products, Inc. Stock is SAE 1060, 13/16" wide and .028" thick. Feed and blank length, .632", operating at 750 strokes per minute.

Replacing steel dies with Carboloy® cemented carbide dies, Tinnerman Products, Inc., obtained...

7,000 extra pieces per hour

THE DIES you use may be complex, like this Tinnerman die. Or simple, like the Armstrong Cork Company die.

In either case, you can speed production, and save time and money, by equipping them with Carboloy cemented carbide.

These two case histories merely indicate the wide range of carbide press-die applications, and their benefits – increased production, decreased maintenance downtime, lower die-maintenance costs, better product-quality control. It all adds up to better products, lower costs, greater customer satisfaction.

A Carboloy Sales Engineer will be glad to show you or your diemaker scores of case histories proving these benefits. He'll show you, too, how simple it is to apply and maintain carbide dies. Write, or send coupon.

"Carboloy" is the trademark for products of the Carboloy Department of General Electric Company

MAIL COUPON TODAY

Carboloy Department of General Electric Company
11101 E. 8 Mile Street, Detroit 32, Michigan

- ☐ Send me Carboloy Die Engineering Manual D-124
- ☐ Send complete details on Carboloy Training School
- ☐ Have a Carboloy Field Engineer call at my plant

Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY

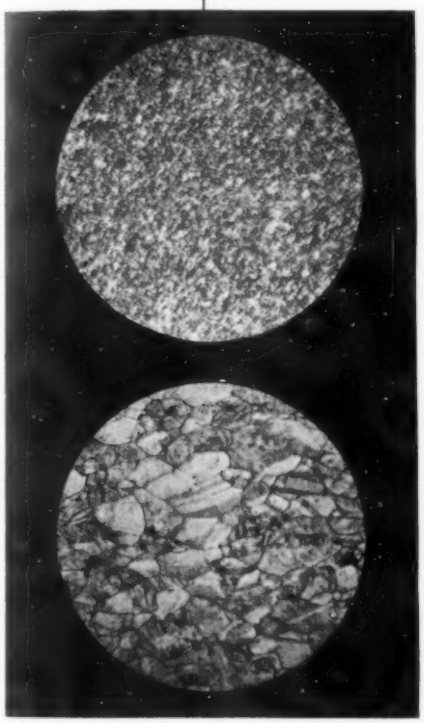
MANUFACTURERS OF CEMENTED CARBIDES, PERMANENT MAGNETS, THERMISTORS, HEVIMET, AND VACUUM-MELTED METALS.

Carboloy Created-Metals for Industrial Progress

DURAFLEX . . .

a NEW fine-grain phosphor bronze with 30% GREATER ENDURANCE LIMIT

FINE-GRAIN STRUCTURE IS THE MAIN REASON . . .



Micrographs (75x magnification) tell the inside story. Top, note the fine-grain structure of DURAFLEX. Compare it with the grain structure of ordinary phosphor bronze, bottom.

DURAFLEX* is a new, fine-grain phosphor bronze developed and sold only by Anaconda. Comparative fatigue tests show that the endurance limit of DURAFLEX is approximately 30% higher than for ordinary phosphor bronzes. In surface appearance, surface smoothness and resistance to corrosion, it is equal to, or better than, other phosphor bronzes. Further, its formability is increased with no sacrifice in yield strength. DURAFLEX is a *premium* phosphor bronze in every way except cost; there's *no increase in price.*

If you're now using a hard-temper phosphor bronze, chances are that you can do the same forming in extra-hard temper DURAFLEX. If you're looking for longer life in the parts you form, we'll be glad to send you a free sample of DURAFLEX. Try it, test it, and you will agree that it's superior.

8576 *Trade-Mark

DURAFLEX fine-grain phosphor bronze

an ANACONDA* product

MADE BY THE AMERICAN BRASS COMPANY

Try a FREE SAMPLE of

DURAFLEX

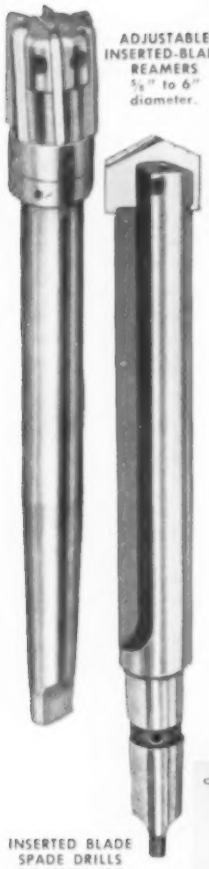
Sheet . . . up to 0.062" thick
Wire . . . up to 3/16" diameter (approx.)

FREE SAMPLE

The American Brass Company, Waterbury 20, Connecticut
(In Canada: Anaconda American Brass Ltd., New Toronto, Ontario)

Yes, we'd like to try DURAFLEX. Please send us a free sample of
sheet in _____ temper, _____ thick,
wire in _____ temper, _____ diameter.
☐ We'd like to talk to one of your metallurgists about DURAFLEX.

NAME .....
COMPANY .....
STREET .....
CITY ..... ZONE .... STATE .....



ADJUSTABLE INSERTED-BLADE REAMERS 5/8" to 6" diameter.

INSERTED BLADE SPADE DRILLS 1-1/32" to 5" diameter.

Inserted Blade Reamers and SPADE DRILLS Help You Cut Tooling Costs

The *inserted blade feature* of Waukesha Reamers, Counterbores, Spade Drills and Special Tools has proved its economy in thousands of applications, in more than a quarter century of service. This feature — combined with their adjustability and their ability to produce *more-holes-per-grind* — make them a valuable aid in the continuous effort to reduce overall tooling costs in your drilling, reaming and boring operations.

Consult Waukesha . . .

for Competent Cutting Tool Counsel — for qualified assistance in adapting standard Waukesha Tools to your needs — or in developing special tools for your special tooling requirements. Write for Waukesha Tool Catalog.

Representatives in Principal Cities

WAUKESHA TOOL CO. WAUKESHA WISCONSIN

Manufacturers of Carbide and High Speed

INSERTED BLADE REAMERS • SPADE DRILLS • TAP DRIVERS
BORING BARS • COUNTERBORES • FLOATING TOOL HOLDERS • SPECIAL TOOLS

IN STOCK for Prompt Shipment

Most standard sizes of WAUKESHA Inserted Blade Reamers and Spade Drills are available for immediate shipment from shelf stock. Write today, for Catalog, Inventory of Sizes, and Current Prices.

Attractive Discounts offered on Certain Sizes for Inventory Clearance

A-7916-½-A

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-4-264-1

Forget ABOUT Oversize and Bell-Mouthed Holes!

On tapping and reaming jobs you can forget all about oversize and bell-mouthed holes if you take one simple precaution—use a Ziegler Floating Tool Holder.

The reason for the superior work turned out when the Ziegler Holder is used is that the Ziegler automatically corrects inaccuracies in the alignment of the work with the spindle.

For example, the alignment may be off as much as 1/32" on the radius (1/16" on the diameter) and the holder will automatically compensate for the difference.

On your next tapping or reaming job, try a Ziegler Holder and see how it will reduce your spoilage losses.

PROMPT DELIVERY

W. M. ZIEGLER TOOL COMPANY
13574 AUBURN DETROIT 23, MICH.

WRITE FOR CATALOG

Ziegler ROLLER DRIVE FLOATING HOLDER for Taps and Reamers...

USE READER SERVICE CARD; INDICATE A-4-264-2

LEITZ OPTICAL JIG BORER

6" x 6" LINEAR CAPACITY FROM MASTER GLASS SCALES IN .00005" — 8" CIRCULAR CAPACITY IN 10 SECONDS OF ARC — OBLIQUE HOLES UP TO 15 DEGREES FROM VERTICAL.

BUILT-IN MICROSCOPE WITHIN SPINDLE CONVERTS MACHINE INTO CO-ORDINATE MEASURING MICROSCOPE

REQUEST CATALOG 8089

Geo. SCHERR OPTICAL TOOLS, Inc.

200-TE LAFAYETTE STREET • NEW YORK 12, N. Y.

USE READER SERVICE CARD; INDICATE A-4-264-3

How many different 10x10 DANLY DIE SETS

can you order from stock at your nearby DANLY Branch?

☐ 100 ?

☐ 1251 ?

☐ 4763 ?

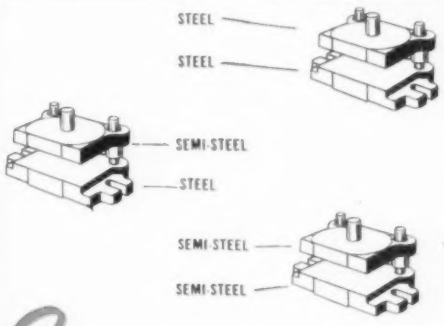
☐ 31,104 ?

3 different punch holder thicknesses

3 different die shoe thicknesses

6 shank size variations

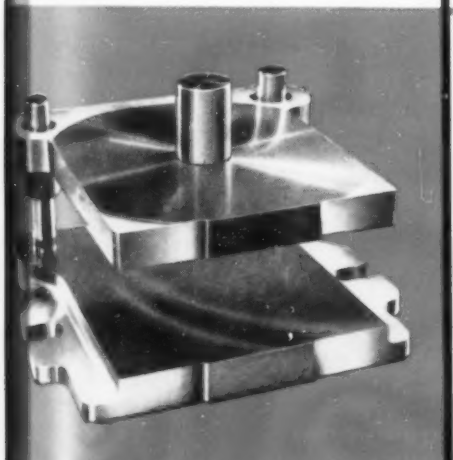
4 bushing type variations



3 different material combinations

16 guide post lengths in each of

3 different styles to choose from



Multiply all of these combination possibilities together and you'll discover that there are *31,104* different standard Danly Die Sets in just this *one* size . . . and all are cataloged and *stocked* in the Danly Branch near you. Amazing? Yes, but it serves to illustrate an important point for *your* benefit. The almost unlimited variety of Standard Danly Die Sets *in stock at your Danly Branch* will meet your specific needs exactly . . . and fast. So remember, when you want the best in die sets in the shortest time, the place to call is your local Danly Branch.

DANLY MACHINE SPECIALTIES, INC. 2100 South Laramie Avenue, Chicago 50, Illinois

Choose the Danly Branch closest to you:

BUFFALO 7
1807 Elmwood Avenue

CHICAGO 50
2100 S. Laramie Avenue

CLEVELAND 14
1550 East 33rd Street

DAYTON 7
3196 Delphos Avenue

DETROIT 16
1549 Temple Avenue

GRAND RAPIDS
113 Michigan Street, N.W.

INDIANAPOLIS 4
5 West 10th Street

LONG ISLAND CITY 1
47-28 37th Street

LOS ANGELES 54
Ducommun Metals & Supply Co.,
4890 South Alameda

MILWAUKEE 2
111 E. Wisconsin Avenue

PHILADELPHIA 40
511 W. Courtland Street

ROCHESTER 6
33 Rutter Street

ST. LOUIS 8
3740 Washington Blvd.

SYRACUSE 4
2005 West Genesee Street

DANLY®

DIE SETS . . .
STANDARD OR SPECIAL

DIEMAKERS' SUPPLIES

CrysCoat*

MOVES IN THE BEST CIRCLES

The Oakite CrysCoat Cleaning-Phosphating Process for preparing metals for painting

FASCO precision-built products are quality-engineered for maximum operating efficiency. Shown here is FASCO's "Lo-Level" floor circulator. Beneath this unit's fine paint finish is a protective coating of CrysCoat to make it look better . . . last longer.

There's an Oakite CrysCoat Process to suit your particular set-up :—

1. Zinc phosphating in spray washer
2. Zinc phosphating in tank
3. Iron phosphating in spray washer
4. Iron phosphating in tank

Each CrysCoat Process gives you a fine phosphate foundation for long-lasting paint adhesion.

Each CrysCoat Process protects against corrosion under the paint.

Each CrysCoat Process is easy to control.

Each CrysCoat Process is solidly backed by nationwide Oakite Service that unconditionally guarantees satisfaction.

Illustrated literature describing the Oakite CrysCoat Cleaning-Phosphating Process gladly mailed on letterhead request.
Oakite Products, Inc., 38H Rector Street, New York 6, N. Y.

SPECIALIZED INDUSTRIAL CLEANING

OAKITE

REG. U.S. PAT. OFF.

MATERIALS · METHODS · SERVICE

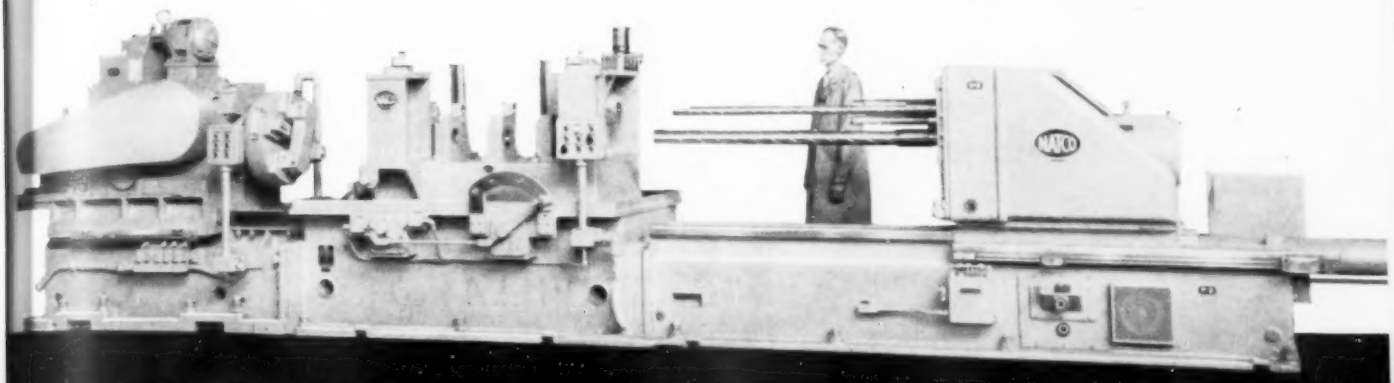
SCIENCE

CrysCoated Products Look Better . . . Last Longer!

Technical Service Representatives Located in Principal Cities of United States and Canada

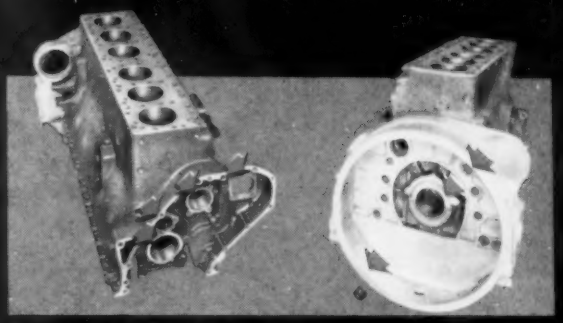
NEW NATCO BOREFACE

SPEEDY, PRECISION PRODUCTION CUTS DIESEL ENGINE BLOCK COSTS



CAM and CRANK FINISH BORING and FACING OPERATIONS DONE SIMULTANEOUSLY ON 4.3 PARTS PER HOUR AT 85% EFFICIENCY!

New NATCO BOREFACE machine, employing two heads, speeds production of diesel engine blocks by finish boring cam and crank holes and boring and cross-feed facing flywheel case simultaneously. The locations and diameters of the straight alignment bores are held to extremely close tolerances. The finished facing on the flywheel housing and cover is held square with the crankshaft bore to within .0025" total indicator reading. These tolerances are made possible by the built-in accuracy of the NATCO BOREFACE and because all operations are performed with one locating of the part.



RIGHT HAND HEAD OPERATIONS
Finish bore 7 (in-line) main bearings
Finish bore oil retainer and cover
Finish bore 4 (in-line) camshaft bearing inserts
Finish bore 2 holes

LEFT HAND HEAD OPERATIONS
Rough, semi-finish and finish bore and rough, semi-finish and finish cross-feed face flywheel housing and cover.

Call a Natco Field Engineer

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One of Latrobe's "free-machining" high alloy die steels, BR-4 FM was developed especially for applications involving extreme abrasive wear such as brick mold liners, shaving dies, stamping dies and deep drawing dies. As the result of the "DESEGATIZED" process, this high vanadium—high chromium die steel is uniform throughout thereby assuring equally high abrasion resistance on all surfaces, freedom from distortion and greater ease of heat-treating. Why don't you specify BR-4 on your next abrasion resistant application?

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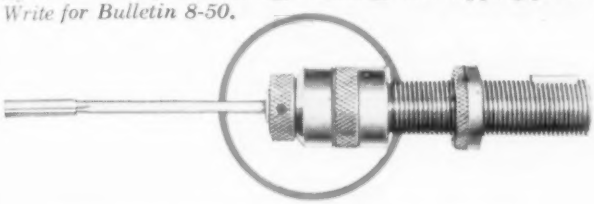
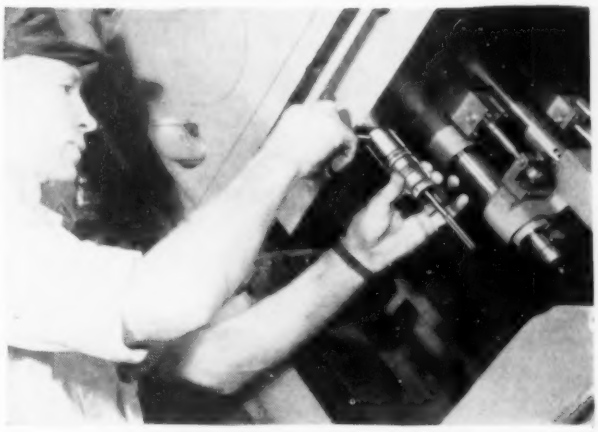
SCULLY JONES

"Precision Holding" Tools solve difficult drilling, tapping and reaming problems...reduce costs!

Newest Floating Holder simplifies tool changes, assures free float

Here's how Greenlee Bros. & Co. uses the Scully-Jones new "JT" Lock and Eject Collet Type Floating Holder on multiple-spindle transfer units. With the double-gear spline drive principle, these floating holders compensate for any misalignment between tools and work . . . easily maintain close tolerances . . . reduce downtime and damage to cutting tools . . . speed and simplify tool changes . . . reduce maintenance troubles and costs. With true freedom of float, they eliminate "dead spots" and cramping—conditions that may be affecting tool life and quality of work on *your* drilling, reaming, and tapping jobs! *Write for Bulletin 8-50.*



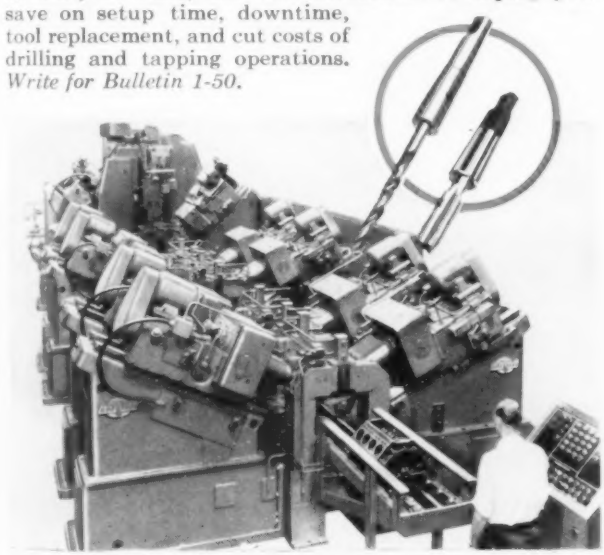


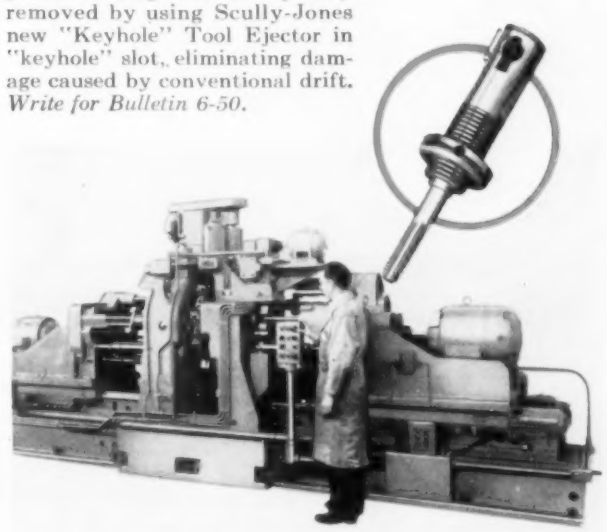
Adjustable Adapters speed tool changes and adjustments

Scully-Jones Quick-Lock Adjustable Adapters help this BARNESDRILL 10-station double end trunnion machine operate at near capacity. The "pilot nose" makes it easy to insert the adapters . . . minimizing setup and downtime for tool changes. Quick-Lock Nut provides quick, accurate depth adjustments at each spindle or in a tool presetting program. Cutting tools are quickly removed by using Scully-Jones new "Keyhole" Tool Ejector in "keyhole" slot, eliminating damage caused by conventional drift. *Write for Bulletin 6-50.*

Drill and Tap Chucks cut production costs on Greenlee transfer unit

Greenlee engineers put Scully-Jones Drill and Tap Chucks on this 16-station transfer unit to provide a positive, accurate drive for the cutting tools. Carefully hardened and ground, they resist nicking, give long life under heavy stresses, or loads, and run concentric . . . helping you save on setup time, downtime, tool replacement, and cut costs of drilling and tapping operations. *Write for Bulletin 1-50.*





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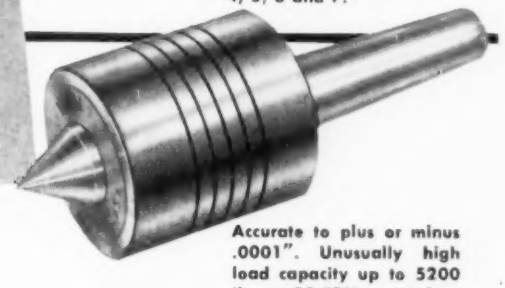
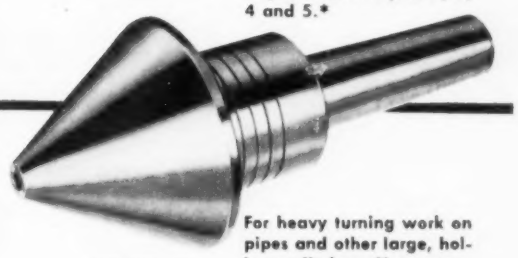
For your BIG jobs! For close tolerance turning on work up to 22,000 lbs. at 50 RPM. Eccentricity of less than .0002". Morse tapers 4, 5, 6 and 7.*



UNIVERSAL

Accurate to plus or minus .0001". Unusually high load capacity up to 5200 lbs. at 50 RPM means better work on a wider range of jobs. Morse tapers 2, 3, 4 and 5.*



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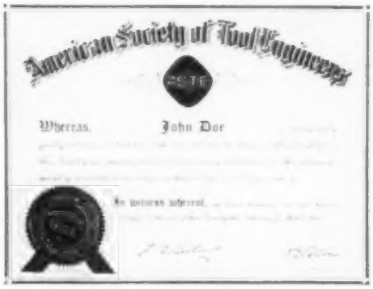

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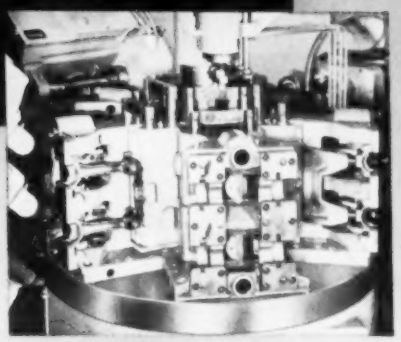


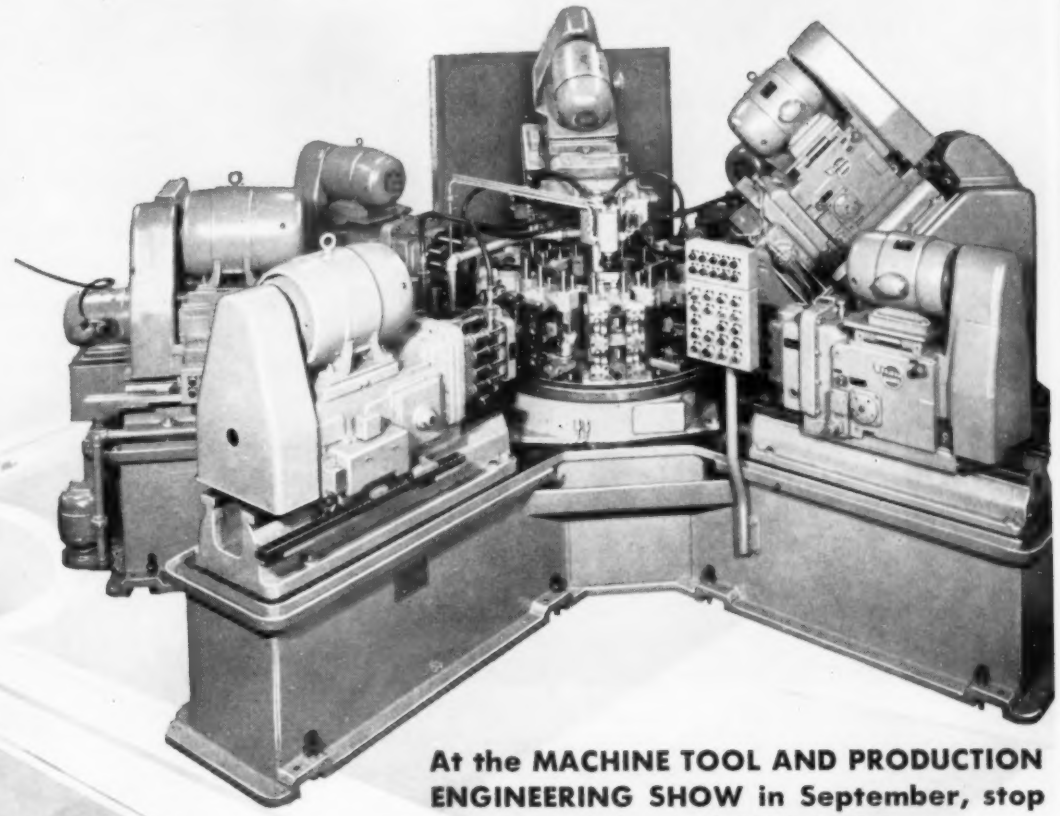
This new type machine drills, redrills, rough-reams and finish-reams the bolt hole; mills the lock slots and burrs them. Available with 4, 6, or 8 stations.

IT IS FLEXIBLE: units are self-contained—they can be used for hundreds of purposes.

IT IS ACCESSIBLE: the wing-type horizontal machine makes it easy for the tool maintenance man.

INDIVIDUAL UNITS FOR REAMING to avoid accelerating the spindles.

This new booklet showing recent KB machine tools will be sent to you on request.



At the MACHINE TOOL AND PRODUCTION ENGINEERING SHOW in September, stop in for a visit at BOOTH 1223.

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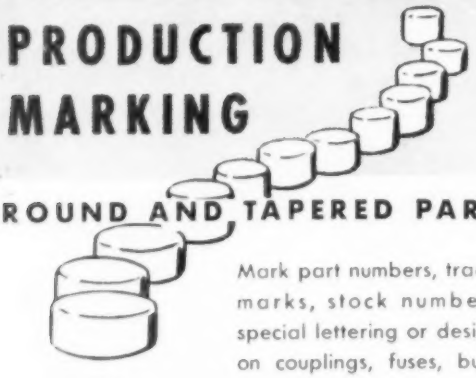

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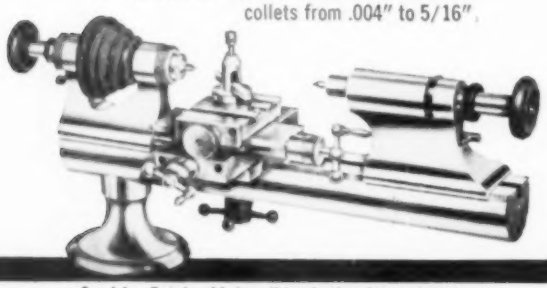

Send for Catalog M describing Lathes for tool work, second operations; turrets and full line of accessories.

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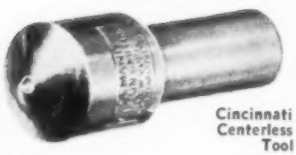

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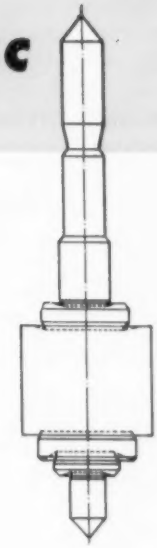
8 Tools IN ALL . . . *the special toolholders readily replaceable with standard holders or attachments.*



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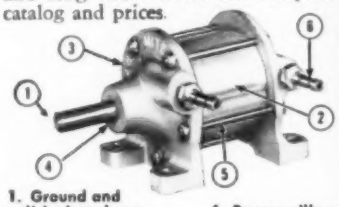

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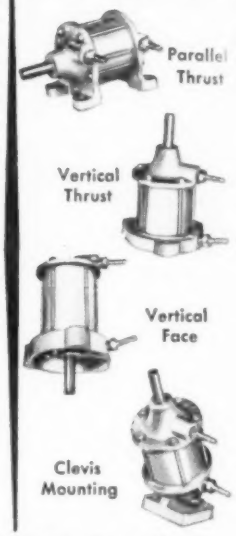
4 Mounting Types



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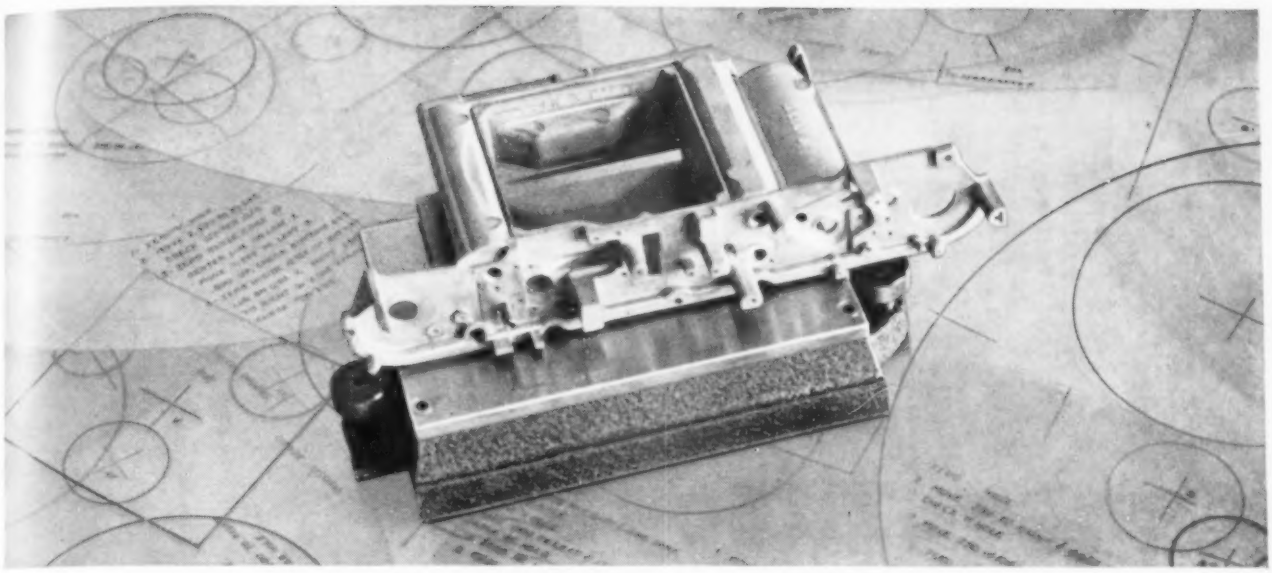


How Graflex, Inc., *cut production costs* with a Kodak Contour Projector

If you've been thinking of optical gaging only in terms of toolroom measurement or final inspection, see what it does when linked to production operations.

GRAFLEX, INC., was producing a complex precision part in which spacing of 40 holes and 12 bosses had to be held to ±.001".

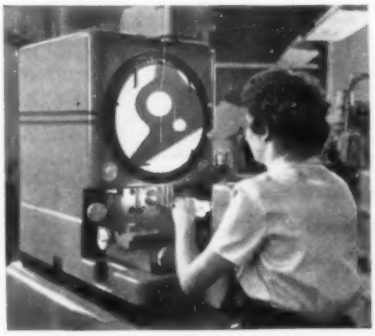
To solve this tolerance problem, Graflex used a Kodak Contour Projector because: (1) mechanical gages would have been too costly for the required run; (2) optical gaging would be faster; (3) the Kodak Contour Projector gave a quantitative as well as qualitative check.

Here's how this helped cut production costs and speed the work:

Optical gaging made it possible to check parts as they were run, to discover errors before more time and labor were spent on the part; no expensive machining was wasted on parts later found to be out of tolerance. It assisted in assembly operations, too, since the exact condition of the parts was known. And the part could be quickly rechecked at any point during production when a question of tolerance or condition arose.

A Kodak Contour Projector was also used in final inspection—doing in 20 minutes a job estimated at 4¾ hours by surface plate inspection. When the run was completed, the comparator was available for another job.

Perhaps you have production problems that can be solved by fast, accurate, *complete* measurement and inspection. There's a field representative in your area who can evaluate your needs for you. To get in touch with him, or for a copy of the illustrated booklet "Kodak Contour Projectors," mail the coupon below.



Graflex, Inc., used a Kodak Contour Projector, Model 2A, for this operation. The Model 2A is completely equipped for precision micrometry. In addition, it has a magnification selector, built-in surface illuminator, and permits the staging of parts in any plane. As with all Kodak Contour Projectors, it requires no hood.

the KODAK CONTOUR PROJECTOR

44

EASTMAN KODAK COMPANY
Special Products Sales Division, Rochester 4, N. Y.

☐ Please send me a copy of your booklet "The Kodak Contour Projectors."
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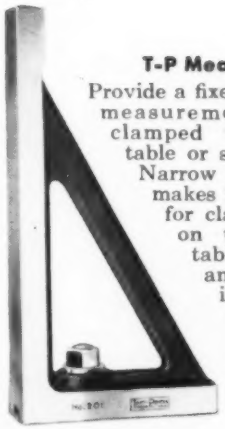
T-P Angle Irons Cut Setup Time

More Cost-Cutting Tips From Taft-Peirce

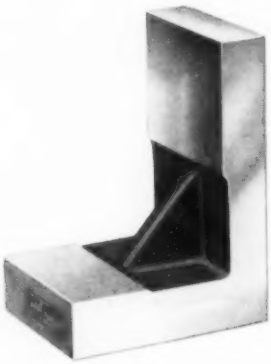


T-P Measuring Iron

Provide a fixed surface for measurements when clamped to machine table or surface plate. Narrow width also makes it convenient for clamping work on the machine table. Front face and bottom finished square within .0002" per foot.

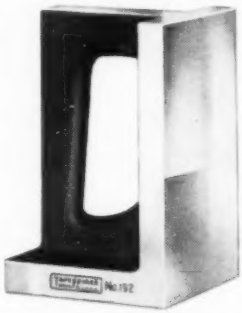
T-P Toolmaker's Adjustable Knee

Table tilts and firmly clamps at angles from 0° to 90°. Graduated quadrant and vernier reads within 5 minutes of angle. Special sine bar feature permits setting within 30 seconds of angle. Surfaces on base right angle are finished scraped.



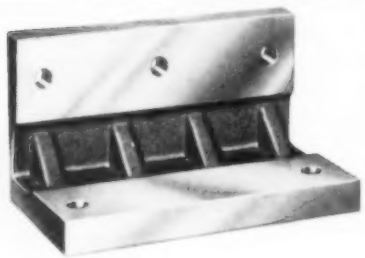
T-P Toolmaker's Knee

Useful for mounting small work. Pads are finished on back of each angle for clamping purposes. Sides and faces are square within .0001". Finest quality close-grained cast iron, heat treated and ground.



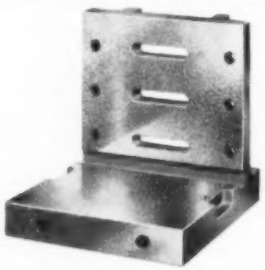
T-P Universal Right Angle Irons

Invaluable wherever an accurately square reference surface is desired. Use as height block or clamp work to one face, and place block in any number of positions to make measurements without relocating. Square and parallel within .0002" or .0003".



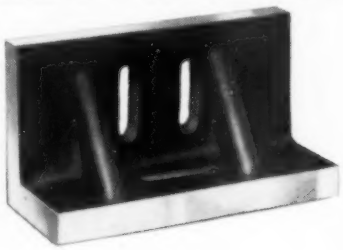
T-P Duplex Angle Irons

Speeds setups on planers, boring mills, shapers, drill presses. In many cases, eliminates need for table clamping. Finished inner pads parallel to sides within .0005". Outer faces ground square within .0005" in 6".



T-P Multiplex Angle Irons

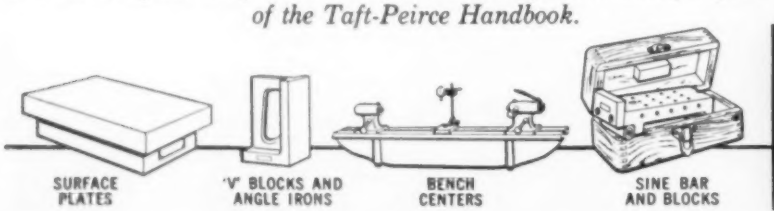
Eliminate multiple setups and excessive handling. All surfaces are scraped square within .0005" in 6" . . . parallel within .0005". Holes and slots for clamp bolts. 4 tapped holes for eye bolts. Recessed lips in base section for clamping.



T-P Slotted Angle Irons

Working faces are ground square within .0005" in 6". Holes and slots for clamping bolts. Finest quality close-grained cast iron, heat treated and seasoned. Stocked in a number of sizes. Hand scraped or specials on request.

For the complete story on these items and many more send for your copy of the Taft-Peirce Handbook.



T-P means Top Precision

THE TAFT-PEIRCE MANUFACTURING COMPANY, WOONSOCKET, RHODE ISLAND

"To increase production and tool life on non-ferrous metals, we recommend GULF CUT-AID,"

say shop foremen and tool engineers.

Here are a few typical examples of the results reported by machine shops since they switched to Gulf Cut-Aid:

- " . . . does a better job on aluminum than any cutting fluid we've ever used."
- ". . . proved superior to 12 other cutting oils we tested. We got 10% greater production, 50% longer tool life;"
- ". . . upped production from 700 to 1000 parts per hour;"
- ". . . rejections entirely eliminated, production increased 20%."

Results like these are possible because Gulf Cut-Aid has a high rate of penetration, good "wettability," and excellent cooling properties. It also contains an effective anti-oxidation additive which helps prevent gum and sludge formation in the coolant system. And it will not corrode or stain metals.

In addition Gulf Cut-Aid is an effective energizer for other cutting oils, regardless of type or viscosity. This blending makes possible higher production speeds and results in improved finishes and longer tool life.

Have a Gulf Sales Engineer show you how Gulf Cut-Aid and other Gulf quality cutting oils can help you improve machining practices in your shop. Call him today at your nearest Gulf office.

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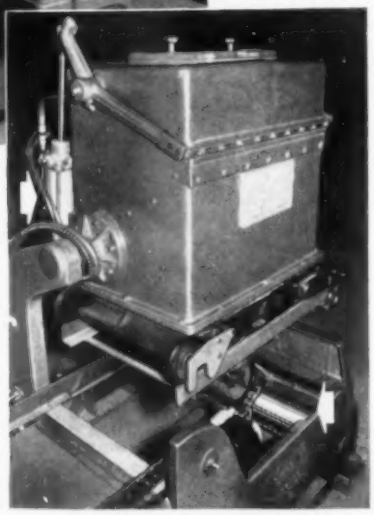
SHELL PROCESS Equipment Utilizes NOPAK Cylinder Power

Shell Process Bonding Machine Equipped with NOPAK 8" Model D Cylinder.

Builder of "Shell Molding" Equipment... Shell Process, Inc., of Chicopee, Mass., employs NOPAK Cylinders in a number of its machines to provide the controlled power necessary for their successful operation.

The top illustration shows a bonding machine utilizing the shell molds produced in the machine pictured below. An 8" Model "D" NOPAK Cylinder advances and retracts the upper pressure plate which, in turn, applies the pressure, through pins and springs, required to seal the two halves of the shell mold before molten metal is poured between them.



This machine which produces shell molds employs 2 NOPAK Cylinders to invert investment box and to open the louver which releases the mix.

The lower picture shows a machine which produces shell molds by the investment process, employing a 4" NOPAK Cylinder to operate the louver of the investment box containing the sand and resin mix which is deposited on the heated pattern. A 6" NOPAK Cylinder, visible in base, rotates the investment box 210°.

Whether you build machines for resale, or for use in your own plant, NOPAK Cylinders and Valves can be used to your advantage in the efficient application and control of fluid power.

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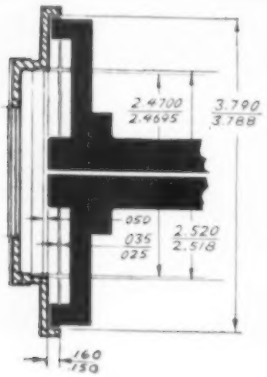

Gaging SHALLOW HOLES done easily

to fractions of .0001"

COMTORPLUG with interchangeable expanding plugs to gage simple or special bores from ⅛" to 8" dia.

UNIQUE ADVANTAGES

Positive gaging accuracy to fraction of .0001" regardless of who operates it.

Indicates actual size, a fixed—not passing—reading.

Positive 2 point gaging—automatic centering.

Shallow holes, deep holes, inside splines, open-end holes gaged easily.

Detects ovality, back or front taper, bell mouth, barrel shape.

Reaches to bottom of blind holes. Gages work while still held in chuck.

A shop tool for all day every day use.

Portable—no wires, hoses or stands.

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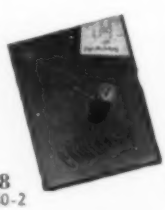

GET THE FACTS—REQUEST BULLETIN 48
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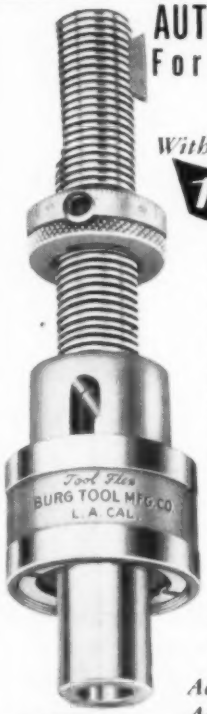
AUTOMATICALLY COMPENSATE For Parallel and Angular Misalignment

With Neoprene Mounted, Full Floating

Tool-flex TOOL HOLDERS



A complete line of adjustable adapter shank "Tool-Flex" floating tool holders is available with Morse Taper Sleeve, Straight Bore or Tap Collets. They are ideal for close center applications and can operate as close as ⅞" centers. Simplicity of construction features only four main parts, assuring long, service-free life. Oil, heat and wear resistant Neoprene insert, found only in "Tool-Flex," coupled with positive drive, provides universal float that corrects for both parallel and angular misalignment, preventing bell mouthing and oversized holes or torn and oversized threads. By floating reamers, taps, etc., in a cushion of Neoprene, tool life is increased by absorbing shock. "Tool-Flex" holders are fully guaranteed.

Acme Threaded
Adjustable Adapter Shank

Write for Bulletin TE-TF4

BURG TOOL MFG. CO., INC.
P.O. BOX 48, GARDENA, CALIFORNIA

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THIS NEW 14" *Logan* LATHE

PERFORMS . . .

AND THE RESULTS PROVE ITS SUPERIORITY

The more jobs you watch this rugged new Logan "6560" perform, the more impressive it looks. On the heaviest cuts, or at maximum speed, it turns the work *smoothly*, quietly, with precision results. Better performance than you are conditioned to expect of a "good" 14" lathe is literally designed, engineered and built into the "6560".

The Variable Speed Drive provides instant rpm adjustment on work requiring variation of spindle speed. The oversize spindle, with 1⅜" bore, turns on a ball bearing mounting that needs no adjustment within the full range of 38 to 1200 rpm. The bed is a wide, deep special alloy casting, extra heavy and resistant to both internal and external stresses. The two V-ways and two flat ways are precision ground. There is extra strength in the wide gears, heavy bearing supports, massive headstock, carriage and base. This extra weight, plus dynamic balancing of the complete lathe practically eliminates vibration. Remarkably moderate price and low cost operation make the "6560" outstanding in economy as well as in precision performance. See it at your Logan Lathe dealer's, or write for Bulletin 14-L, giving a full description.

SPECIFICATIONS AND FEATURES

14⅝" swing over bed
9" swing over saddle
1⅜" spindle hole
1" collet capacity
40" between centers

Variable Speed Drive
Ball Bearing Spindle
38 to 1200 rpm
Two-V-way, Two-flat way
Precision Ground Bed
Precision Carriage

LOOK TO LOGAN FOR BETTER LATHES AND SHAPERS

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Lawrence and Lamon Ave., Chicago 30, Ill.

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Two views of Heald-Borematic boring machines equipped with U. S. PowerGrip TIMING Belts and sheaves. Note the teeth in the belts and in the pulleys. They transmit the power of 2 motors on each machine, and are subjected to tremendous shock loads.

A leading auto plant reaps savings in production time and labor... by installing U. S. *PowerGrip* "TIMING"® Belts

By changing its power transmission (on Heald-Borematic machines) to U. S. PowerGrip TIMING Belts, the auto plant gained these immediate mechanical benefits:

- Sheaves and belts were reduced in number on each machine from 6 to 4.
- Previous belts had to be replaced every 2 weeks. U. S. PowerGrip TIMING Belts have been on the job for 3 months—yet show *no sign of wear!*
- The machines are now far more efficient. They deliver a more uniform speed and, because they do not stall, they give a better finish to the work.

So convincing was the saving in production time and the reduction in maintenance and replacement of parts, that the management of the auto plant has now equipped all Heald-Borematics with U. S. PowerGrip TIMING Belts and sheaves.

A development of United States Rubber Company, the U. S. PowerGrip TIMING Belt has grooves which fit into teeth in the pulleys—with perfect non-slip grip and a uniform transmission of power. This belt has revolutionized power transmission in hand tools, lathes, drill presses, saws, electric typewriters and thousands of other applications. The absence of metal-to-metal contact makes lubricants and oil-retaining housings unnecessary. The smaller pulleys permit very short centers and high ratios. Light weight permits very high speeds, yet with its non-slip grip the belt can handle speeds so slow as to be almost imperceptible to the eye. Because there are no friction-creating joints, no slippage, no lubricated drag, the U. S. PowerGrip belt has an efficiency close to 100%. Obtainable at any of our selected distributors or 27 "U. S." District Sales Offices or write address below for free catalog.

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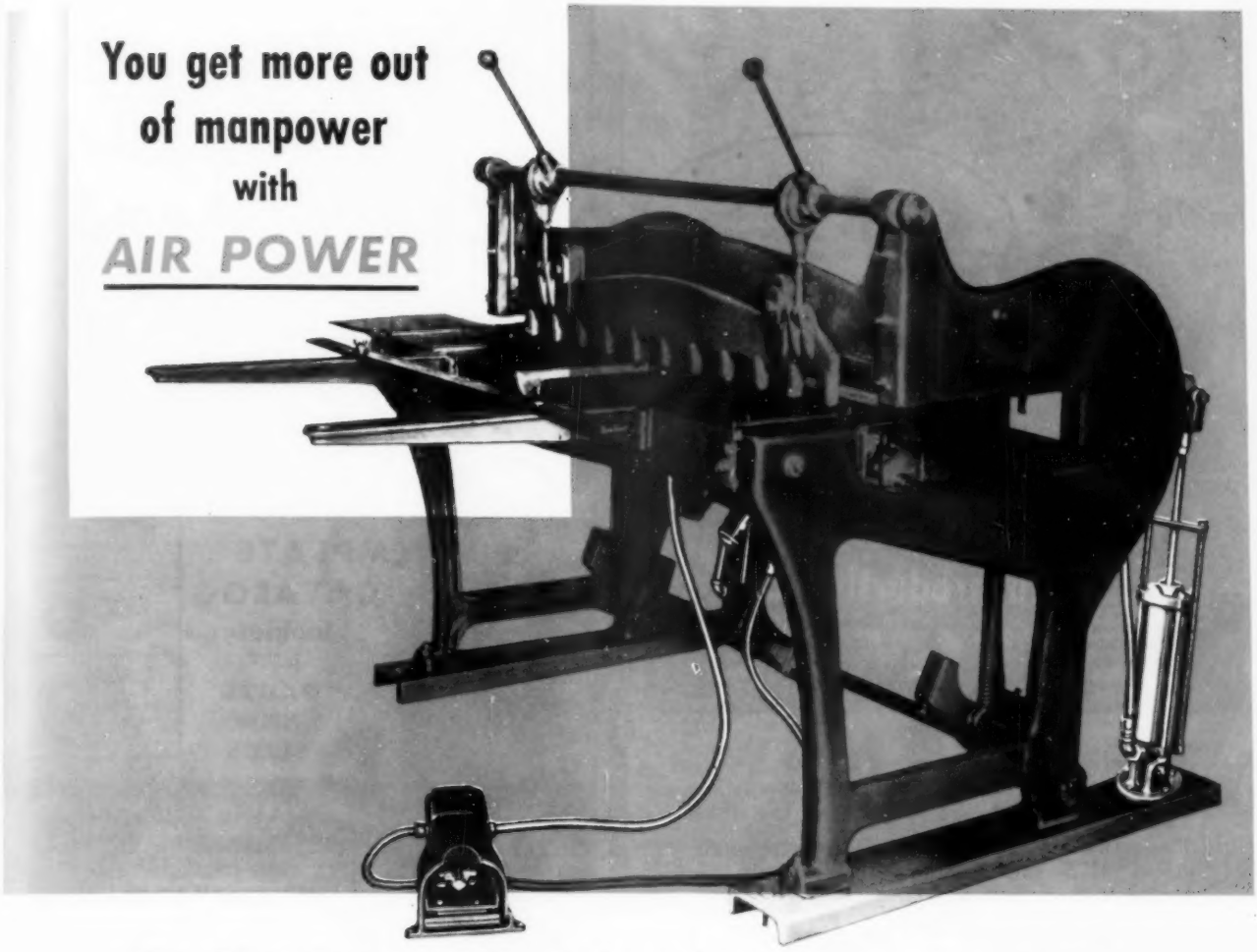

Modernize with Schrader shear controls

Just a light touch of the toe is all it takes to operate your shear after you equip it with a Schrader Pneumatic Control.

Have you ever watched your operators riding the foot lever to cut heavy gauges of metal? Sometimes taking two men to do the job?

Now that is all changed. When Schrader Equipment operates the shears with tireless muscles of compressed air, one operator can do the work of two. The foot pedal can even be positioned to operate at a distance. It all adds up to top production—with minimum fatigue.

This is just one example of hundreds where Schrader Air Equipment can speed production . . . lower fatigue . . . increase safety. To find out how you can put Schrader Air Equipment to work in your plant, send us a letter describing your installation—or fill out the coupon below.

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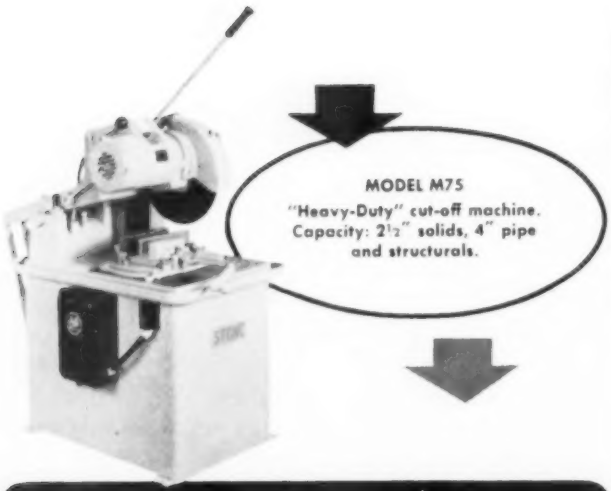

Cuts hardened tool steel Increased production over 5 TIMES*

A large Detroit tool shop formerly teamed a power hack saw with a band saw for cutting hardened tool steel.

These two machines were replaced by a single model M75 cut-off machine. *Result.... Model M75 increased production over 5 times. Cost data proves tremendous economy of Stone machines compared to other methods.

- Cuts any metal — ferrous or non-ferrous—in 2 to 4 seconds per sq. inch.
- Used for cutting bar stock, pipe, tubing, structurals, etc.
- Leaves milled-like finish with tolerance less than ±.005; reduces the need for further machining.
- No change of characteristics or hardening of stock.

EXCLUSIVE FEATURES BY STONE

- Geared-in-head motor delivers maximum power to cutting edge for greatest efficiency.
- Self-centering vise presents least arc of contact for faster cutting, longer wheel life.
- Vise plate calibrated in degrees permits speedy change-over from straight cutting to angular cutting up to 46°.

OPTIONAL FEATURES

- Semi-Automatic Power Stroke provides simpler operation, minimizes operator fatigue; gives up to 25% longer wheel life.
- Oil Mist Spray attachment for cooler, easier cutting increases saw blade life up to 400% on non-ferrous materials.

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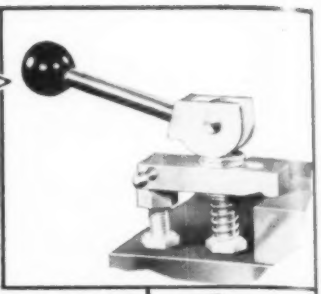

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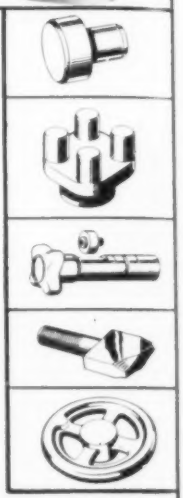

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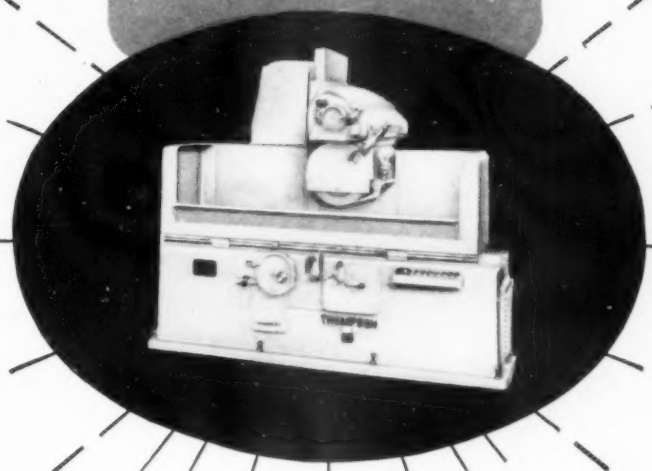

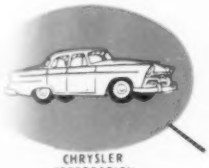

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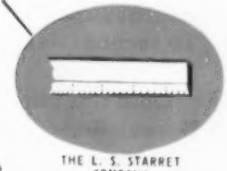

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THE THOMPSON GRINDER COMPANY, SPRINGFIELD, OHIO

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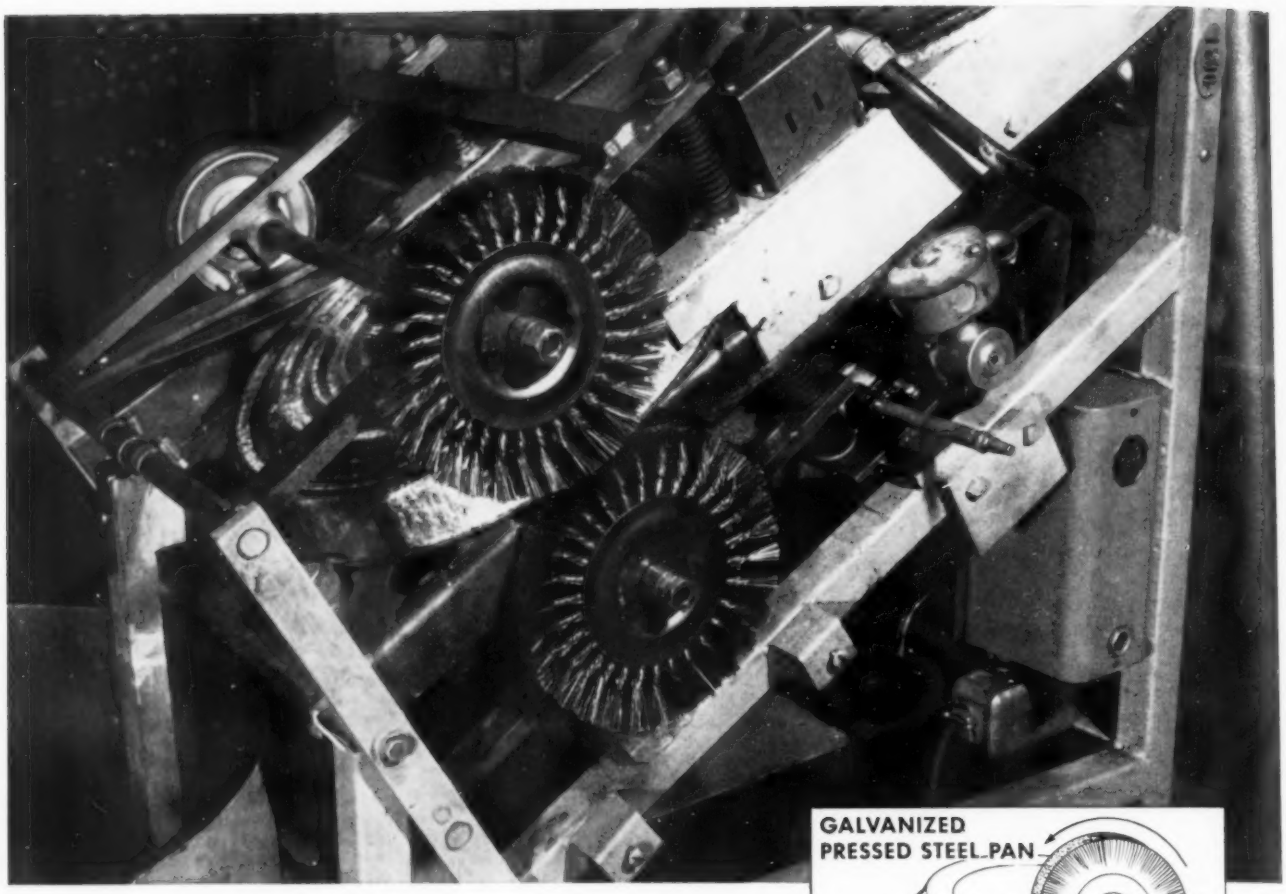
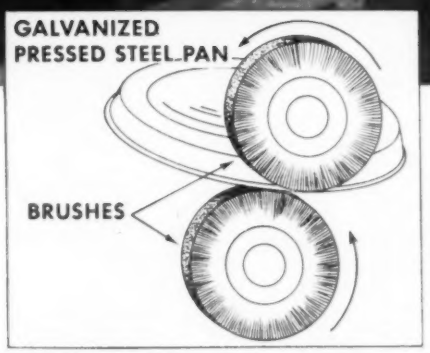




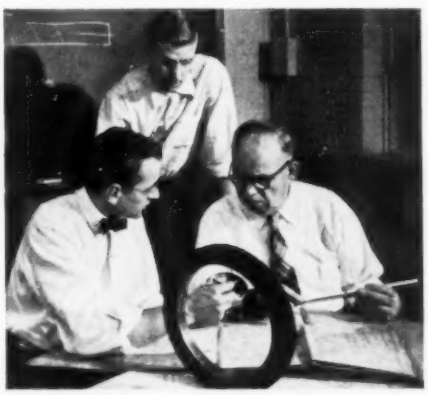
10-second brush-off removes excess coating

Let an OBA help solve your production problems

A touch of ingenuity and Osborn Power Brushing. That's all it takes to remove hard drips of zinc from these galvanized steel pans.

After pans are dipped for galvanizing, the operator merely drops them in place on this machine. Two Osborn Disc-Center® Brushes spin the pans, brush the spelter from the edges. In 10 seconds—all the time it takes for brushing, pans are ejected automatically.

Does this idea suggest an answer to a problem you have? An **O**sborn **B**rushing **A**nalysis can show you where power brushing will help speed production, improve product quality. Call or write *The Osborn Manufacturing Company, Dept. K-14, 5401 Hamilton Avenue, Cleveland 14, Ohio.*



ENGINEERING HELP. *When an Osborn Brushing Specialist makes an* **OBA** *in your plant, he'll study your cleaning, finishing and burr removal operations . . . show where you can cut costs, boost product quality.*

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NEW *Grip-Tip* CENTERS

CHECK THESE *Grip-Tip* FEATURES

- Long-Life Holders
- Replaceable Carbide Tips
- Easy Insertion and Removal of Male or Female Tips
- Reduced Machine Down-Time
- Lower Cost for Replacement of Carbide Tips
- Carbide Tips Accurate to .0005"
- No Regrinding of Holder
- Carbide Tips Are Easy and Inexpensive to Stock
- Reduced Regrinding Time
- Longer Diamond Wheel Life

with

REPLACEABLE CARBIDE TIPS

Grip-Tip Centers are specifically designed to substantially reduce your replacement costs and machine down-time for regrinding or replacement of worn or chipped centers.

Male or female carbide tips are inserted or removed from the tool steel holders by simply turning a screw. The unique clamping action of holders on tips is positive and quick . . . you save replacement time with Grip-Tip Centers.

The life of Grip-Tip holders is practically unlimited, for, only the dull or chipped carbide tips are reground. Because the steel holder is not ground when sharpening the carbide tip there is less clogging and longer life for your diamond wheels. Also, the relatively inexpensive double end tips in both male and female types can be stocked with a minimum investment . . . Grip-Tip Centers reduce tool and inventory costs.

Grip-Tip Centers increase your production by permitting full utilization of machine tools. It takes but a minute to remove old carbide tip and replace with a new one . . . machine down-time is less with Grip-Tip Centers.

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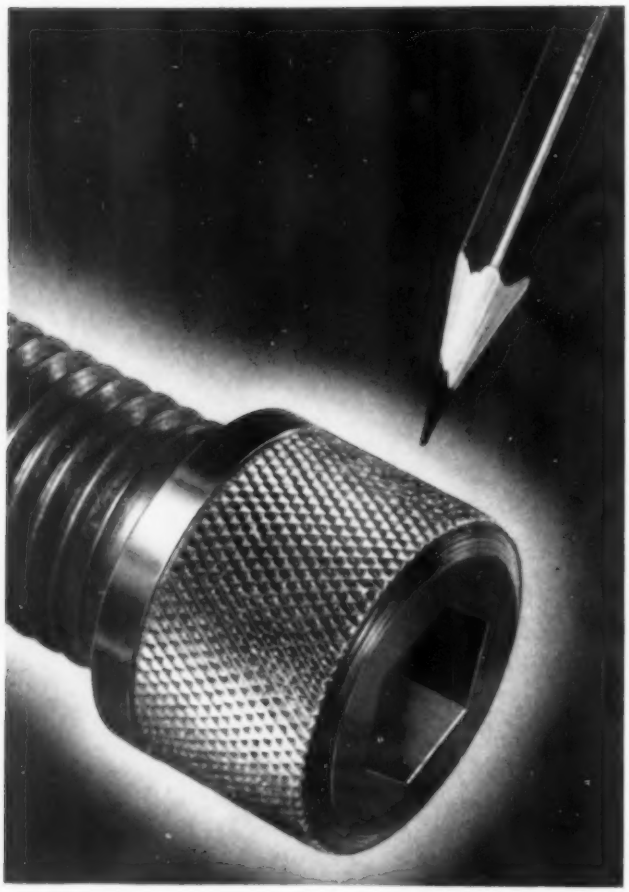
D R & T COMPANY



For Quality Socket Cap Screws Look for the Bristol Diamond Knurl

The Bristol Diamond Knurl is the sign of a quality socket cap screw. It high-lights the overall care we take in producing these screws.

Everything about them has to be just right – or they don't pass our quality-control inspectors. As a result, every Bristol cap screw spins easily into place, fits perfectly and wrenches up tightly – so tightly that shock and vibration will never loosen them.

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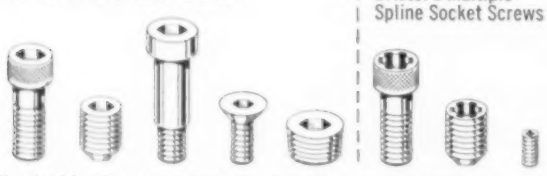
A.5.2

Bristol's Hex Socket Screws

Bristol's Multiple-Spline Socket Screws



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Lovejoy H. S. S., Carbide and Cast Alloy Blades are interchangeable in the same housing and are stocked for immediate shipment.

For standard or special cutters, call on Lovejoy – suppliers to the world's leading manufacturers for over 35 years. Write today for Catalog No. 28 which describes the full line of Lovejoy tools.

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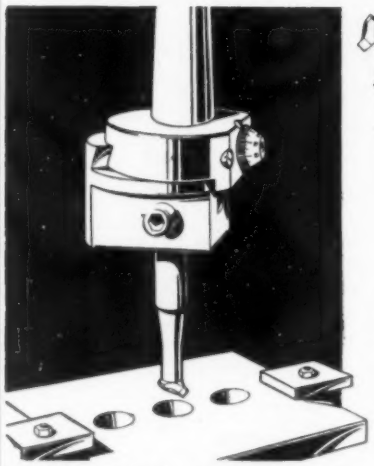

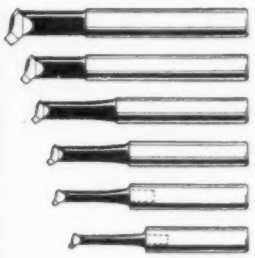

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- **for internal threading**

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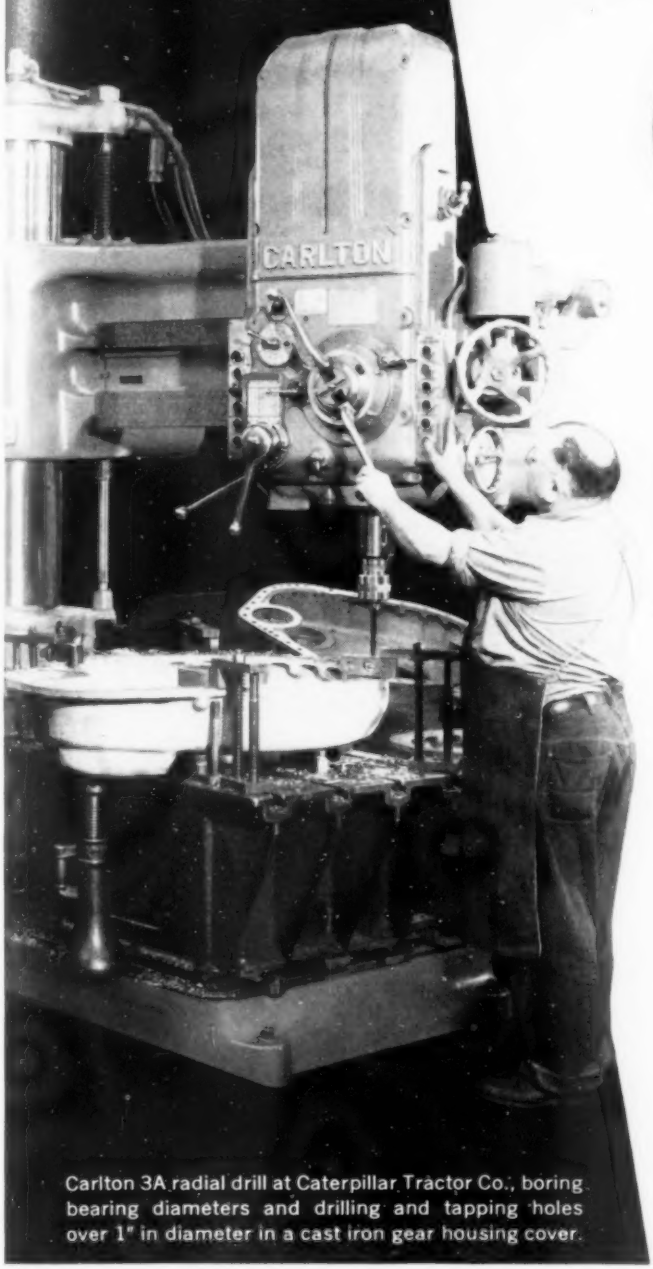
Carlton
radial drills



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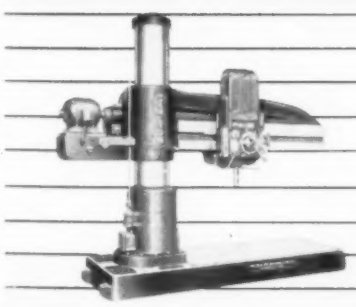

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The Carlton Machine Tool Co. Cincinnati 25, Ohio

Please send us descriptive bulletins on Carlton radial drills in sizes indicated:

Arm	Column
____ft.	____in.
____ft.	____in.
____ft.	____in.

Name_____

Company_____

Street_____

City_____ Zone____ State_____

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April, 1955 Issue

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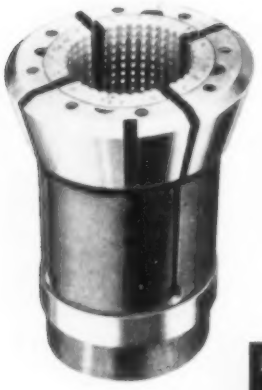

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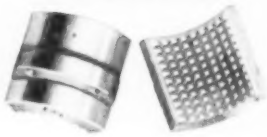

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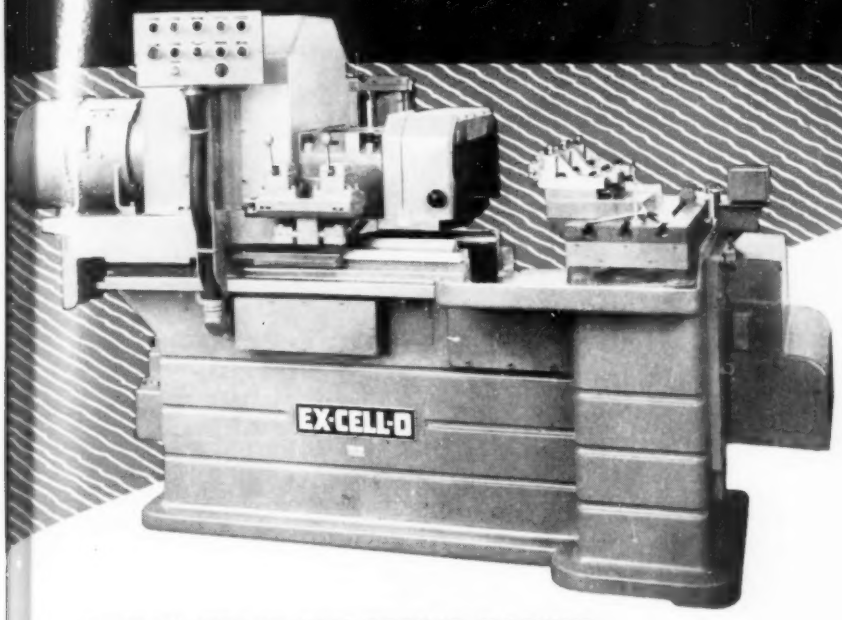
contours valves by direct cam action (no levers)



Ex-Cell-O's new Style 312 Precision Boring Machine operates with direct cam action—is fast, accurate, automatic—is solid and rugged to handle tough jobs of precision contouring, boring, turning, facing, and grooving. For full information contact your Ex-Cell-O representative or write Ex-Cell-O in Detroit.

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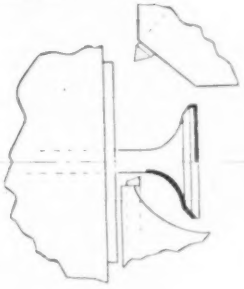
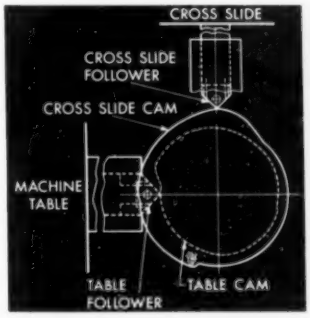
VALVES ARE CONTOURED, faced, turned, and taper-turned. This drawing shows the two tools used in each station. The paths they follow on the workpiece are indicated in heavy lines.



CONTOURING ACTION: Cams act directly on the slide—**NO LEVERS.** Separate cams for table and for cross slide are both on one shaft, giving exact co-ordination.



CAMS CHANGED IN MINUTES: Cam assembly swings out for quick change of operation. All motors are outside the base.

CHIPS, COOLANT CANNOT ENTER THE BASE. Large chip chute is cast integral with the solid top of the heavy nickel iron base.

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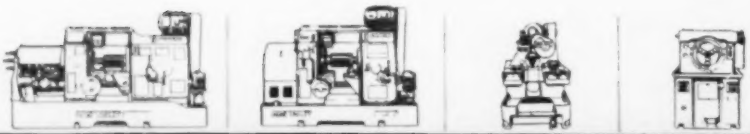
- *Use Namco micrometer gage to check and set chasers or cutters during resharpening. No time-wasting trial cuts required.*
- *Standard Vers-o-tools are made in revolving Style DR and non-revolving Style DS for diameters .056" to 6½": Style DBS for BSA and Brown & Sharpe automatics.*



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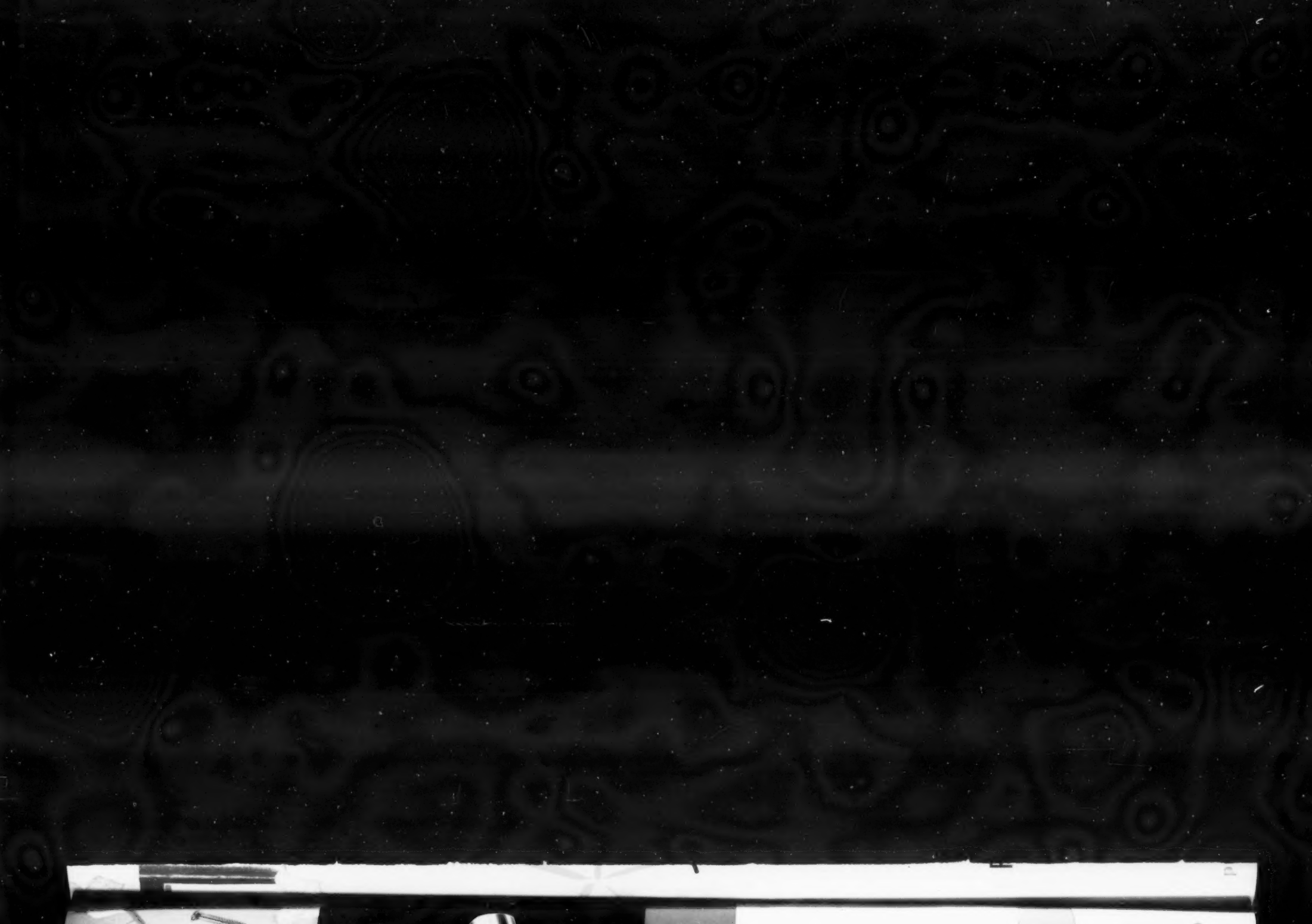
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